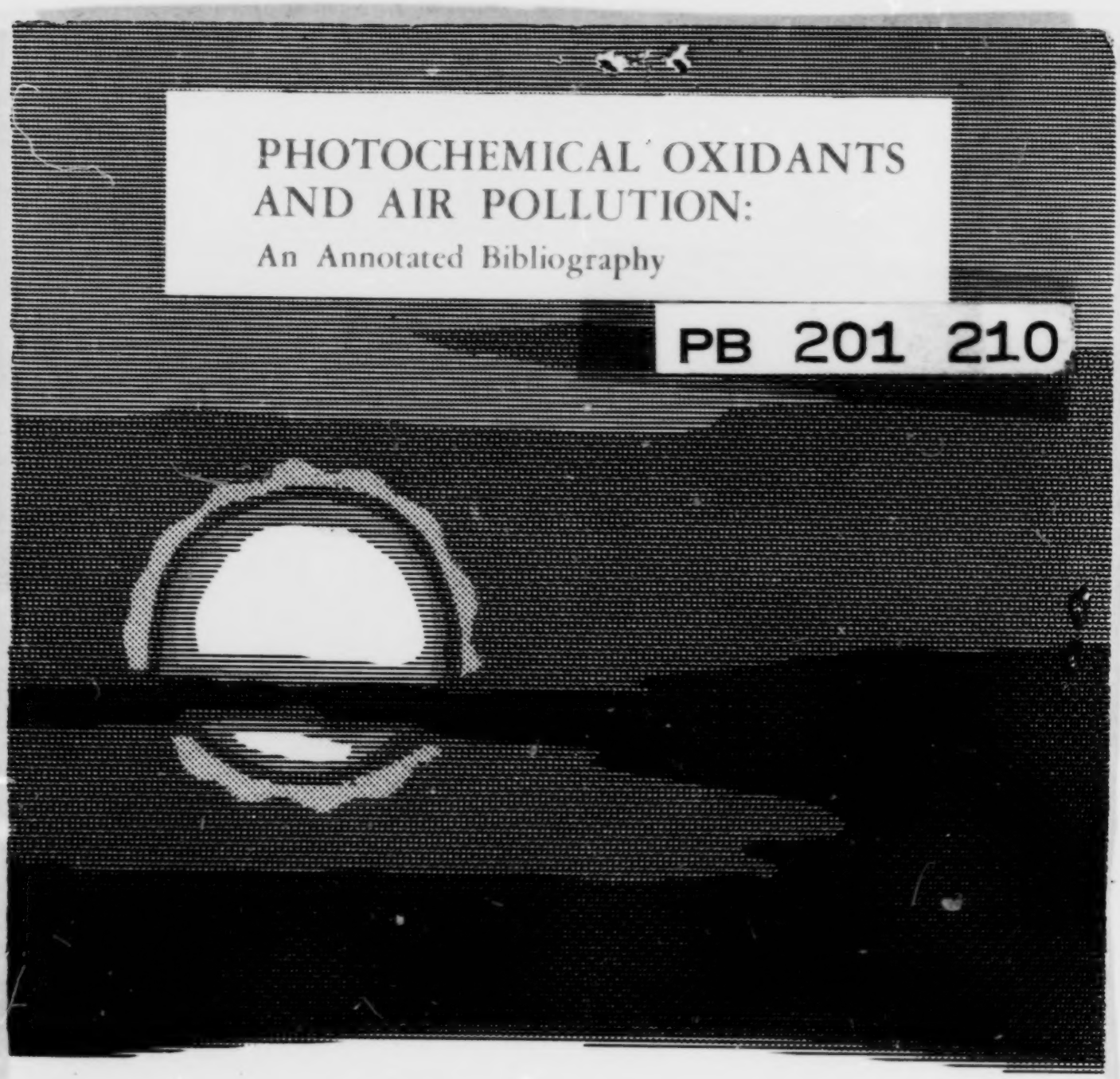
PHOTOCHEMICAL OXIDANTS AND AIR POLLUTION:

An Annotated Bibliography

PB 201 210



PART 1. CATEGORIES A THROUGH F

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PHOTOCHEMICAL OXIDANTS AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

PART I.

Office of Technical Information and Publications
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Air Pollution Control Office
Research Triangle Park, North Carolina
March 1971

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Air Pollution Control Office Publication No. AP-88

PB 201 210

STANDARD TITLE PAGE FOR TECHNICAL REPORTS	1. Report No. AP-88	2. Govt. Accession No.	3. Recipient's Catalog No.

4. Title and Subtitle
Photochemical Oxidants and Air Pollution: An Annotated Bibliography - Part 1. Categories A to F and Part 2. Categories G to N and Indexes

5. Report Date March 1971

6. Performing Organization Code

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
U. S. Environmental Protection Agency
Air Pollution Control Office
Research Triangle Park, North Carolina 27711

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Agency Name and Address
Same as above

13. Type of Report & Period Covered

14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstracts
A compilation of approximately 1,900 abstracts on photochemical oxidants are presented in a volume of 2 parts. Part I contains abstracts arranged in the following categories: General; Emission Sources; Atmospheric Interaction; Measurement Methods; Control Methods; and Effects - Human Health: Part II contains indexes and the following categories of abstracts: Effects - Plants and Livestock; Effects - Materials; Effects - Economic; Air Quality Measurements; Legal and Administrative; Standards and Criteria; Basic Science and Technology; and Social Aspects.

(APCO obtained)

17. Key Words and Document Analysis. (a). Descriptors
Air pollution
Photochemical reactions
Oxidizers
Bibliographies

17b. Identifiers/Open-Ended Terms
Photochemical Oxidants
Air pollution effects (animals)
Air pollution effects (plants)
Air pollution effects (materials)
Air pollution detection
Air pollution control

17c. COSATI Field/Group 13B, 7E

18. Distribution Statement Available from Superintendent of Documents - Washington, D. C. 20402
EP4.9:88

19. Security Class (This Report)	21. No. of Pages
UNCLASSIFIED	1536
20. Security Class. (This Page)	**22. Price**
UNCLASSIFIED	6.25

(2 volume set)

FORM NBS-867(1-70)

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PHOTOCHEMICAL OXIDANTS AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

INTRODUCTION

This bibliography is the result of an effort to collect, condense, and organize the literature on photochemical oxidants in relation to air pollution.

Abstracts of approximately 1,900 documents are presented here. The documents were collected from many sources, and all are included in the information retrieval system of the Air Pollution Technical Information Center (APTIC). Most of them are from recent literature (1959-1970); however, some abstracted documents date from the early part of this century.

Abstracts are arranged in the categories listed on the Contents page of this bibliography. Each category is designated by a letter of the alphabet; each abstract is designated by its APTIC accession number. Numbers within each category are arranged in ascending order. Accession numbers are assigned as literature is received in APTIC. No structure is designed into the numbering system; however, recent literature is more likely to have higher accession numbers.

An author index, a title index, a subject index, and a geographical location index follow the abstracts; they refer to the abstracts by category letter and APTIC number. The author index lists the first two authors individually when there are at least that many. The first author is indicated by an asterisk (*). The geographical location index is divided into two sections: United States (states, cities) and Foreign (countries, cities).

This compilation of abstracts is intended as a balanced sample of available literature; it is composed of selected references, and no claim of all-inclusiveness is made.

All documents abstracted herein are currently on file at the Air Pollution Technical Information Center, Air Pollution Control Office, Environmental Protection Agency, P.O. Box 12055, Research Triangle Park, North Carolina 27709. Readers outside the Air Pollution Control Office may seek duplicates of documents directly from libraries, publishers, or authors.

A. GENERAL

00233

W.L. Faith

THE NATURE, SOURCES, AND FATE OF AIR CONTAMINANTS. J. Air Pollution Control Assoc. 13, (10) 483-5, Oct. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

A brief synopsis of air pollution specifying the types of pollutants, their habitat, the importance of aerosols and gases, and effect of meteorology on air pollution is presented. In broad terms, the problem of air pollution as it relates to health impairment is discussed.##

00539

H. Stephany

TYPE AND EMISSION QUANTITIES OF INDUSTRIAL AND DOMESTIC FLUE GASES AND VEHICLE EXHAUST GASES. (Art und Emissionsmengen von Industrie-, Hausbrand-und Kraftfahrzeug-Abgasen.) Erdoel Kohle (Hamburg) 19(6):457-461, June 1966.

Types of air pollution which occur in Germany are discussed. The Clean Air Committee of the Association of German Engineers is described. The committee's program and published regulations for the limitation of emissions are tabulated.##

00896

E. Weber

(ANNUAL REVIEW OF THE PURIFICATION OF THE AIR (SECOND SERIES).) Jahresubersicht Reinhaltung der Luft (2. Folge). Giesserei (Duesseldorf) 53(12):405-410, June 9, 1966

This a comprehensive review of air purification problems with 116 references, mainly from the German literature. Articles reviewed include government regulations in various countries, aspects of dust and gas accumulations, disposal of fluorine and sulfur compounds in the air, maximum concentration permissible in working areas, and measurement of emission of gases.##

00984

S. Tilson

AIR POLLUTION. Intern. Sci. Technol. No. 42:22-31, 1965.

The problem and the approaches to solving it are reviewed. Pollution sources, research, air quality criteria, the need for controls, social attitudes, standards, photochemical reactions, and future prospects are included.##

01000

J. T. Middleton

THE AIR - A POLLUTED ENVIRONMENT. Preprint. (Presented at Syracuse Univ., N.Y., May 9, 1967.)
HEW

A description of the air pollution problem, both currently and future implications, is presented. The sources of pollution, their deleterious effects, and measures to control them are discussed.##

03058

A. P. Altshuller.

AIR POLLUTION: PHOTOCHEMICAL ASPECTS. Science 151, (3714) 1105-6, Mar. 4, 1966

This paper gives a brief summary of presentations at the Symposium on the photochemical aspect of air pollution, which was held April 1965 in Cincinnati, Ohio. Topics ranged from the measurement of solar radiation in the ultraviolet region of the biological aspects of irradiation of model systems in the laboratory to the relation between meteorological parameters and chemical effects in polluted atmospheres.##

03085

A.C. Stern

PRESENT STATUS OF ATMOSPHERIC POLLUTION IN THE UNITED STATES. Am. J. Public Health (Presented at the 86th Annual Meeting, American Public Health Association, St. Louis, Mo., Oct. 29, 1958.) 50, (3) 346-56, Mar. 1960

The status of air pollution in the United States is reviewed in terms of knowledge availabe and action taken to deal with this problem. Studies by the National Air Sampling Network, state, and local health agencies are reviewed. Facilities for training persons for air pollution work are discussed, and the Federal Air Pollution Engineering Research and Technical Assistance Program is surveyed. (Author abstract)##

03372

TRACE SUBSTANCES IN NON-POLLUTED AIR. STAUB (English Transl.) 26, (8) 40-1, Aug. 1966.
CFSTI, TT 66-51159

An international convention took place at St. Moritz-Bad, June 1966, to honor Prof. Dr. med. Fritz Verzar (Prof. Verzar is a physiologist and the designer of the fully automatic recording condensation-nuclei counter named after him). The subject was: "Tracer Substances in Non-Polluted Air and Their Possible Effect upon Human Beings." Prof. Dr. Ch. Junge of Mainz occupied the chair. It was intended to survey available knowledge on atmospheric condensation nuclei and their possible physiological effect. Prof. Junge of Mainz commenced by demonstrating that, within the size distribution of atmospheric aerosols, the so-called "Aitken nuclei" occupy the range from r is less than or equal to 0.007 to 0.055 microns. Only these are detected by the condensation-nuclei counter of Verzar and by the Scholz counter. The condensation nuclei form approximately 1/10,000 of the total substance of atmospheric aerosols. Cyclic changes of condensation and evaporation processes to which the nuclei are exposed in the atmosphere affect particle size distribution and its changes by factors of up to 10. Prof. H.W. Georgii of Frankfurt/M., dealt with the air chemical effects of condensation nuclei. Prof. Israel of Aachen lectured on the principles of natural radioactivity, especially on its sources and distribution in the ground and in the atmosphere. Mr. Reiter, Director of the Bioclimatic Research Center, Partenkirchen, demonstrated the multiciplicity of atmospheric electrical phenomena in the mountains, as well as those connected with neutral aerosols as a factor of meteorological conditions. Jacobi of the Hahn-Meitner Institute at Berlin Wannsee reported on the penetration of finely dispersed aerosols into the human respiratory tract. Poetzl (Forschungsstelle Partenkirchen) dealt with the identical problem and described the design and functioning of the respiratory tract model which he developed (retention only). Reifferscheid reported on airborne germ studies in the open air and in rooms used for various purposes, using the "Biological Nonimeter" developed by him. Amelung discussed the effect of dust content on the air quality of resorts as a factor of orographic conditions, on the one hand, and a plurality of meteorological relationships, on the other. Prof. Fleckenstein, the Freiburg physiologist, reported on the electro-physiological investigations of cell membranes.##

03556

M. Katz.

SOME TOXIC EFFECTS OF AIR POLLUTION ON PUBLIC HEALTH. Med. Serv. J. (Can.) 16, 504-25, June 1960.

Nature of atmospheric contamination is reviewed. Brief descriptions are given of air pollution episodes, legislation, epidemiology, sources of air pollution and their effect on health. Air pollution research in Canada is summarized.##

03674

J. P. Lodge, Jr.

AIR POLLUTION (REVIEW OF APPLICATION OF ANALYSIS). Anal. Chem. 33(5):3R-13R, Apr. 1961.

This review covers the years 1959 and 1960, which have seen great activity in the air pollution research field. It supplements the previous review, with the exception that the growth of the literature has been so great that explicit coverage of radioactive pollutants has been omitted from this review. The trend toward increased interest in automotive exhaust and atmospheric carcinogens, noted in the previous review, has continued. In addition, there has been a reneval of interest in atmospheric lead. For the most part, these observations hold only for the United States. The bulk of research in Europe continues to be directed toward improved methods for measurement and control of sulfur dioxide and dust. Meetings and conferences were numerous. The annual symposia organized by the Committee on Air Pollution, American Chemical Society, featured sessions on automotive exhaust and on polynuclear hydrocarbons in 1959, and on photochemistry and fine particles in 1960. The Air Pollution Control Association continued its regular schedule of meetings. A conference on air pollution research was sponsored by the U.S. Public Health Service in New Orleans in early 1960, continuing a series of meetings intended primarily for the Public Health Service contractors and grantees in the field. More specialized meetings included a conference on dust in Vienna, one on adhesion of fine particles at Leatherhead, England, and a symposium at Oxford on atmospheric diffusion and turbulence. Increasing public interest in air pollution resulted in the publication of a large number of papers intended primarily for public consumption. These are too numerous and in general too lacking in novelty to warrant mention here. On the other hand, a substantial number of books and review articles of a general nature were published having high scientific merit.##

04172

G. P. Gushchin

ATMOSPHERIC OZONE AND ITS EFFECT ON SOME VEGETATION SPECIES.

U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part II - Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 229-32. 1965. Russ. (Tr.)
CFSTI: TT 6662191

The problem of atmospheric ozone effect on man, plant and materials is briefly reviewed. Harmful ozone concentrations can be expected in the atmosphere at certain heights. This is of particular importance to present day and future aviation, in view that external air is used for passengers and crew. Special measures for the protection of passengers and crew become necessary at 10 km and higher. Decomposing effect on rubber is also demonstrated, although ozone affects various rubbers differently. Some types of tobacco leaves are sensitive to ozone effect and could serve as indicators.##

04381

R. L. Lehman

THE BIG POLLUTION PROBLEM. Kinzoku (Metals) (Japan) 18, (6) 679-84, June 1966.

This is a general review of the problems of air pollution, past, present and future. The different types of pollution arising from different geographic and economic factors which occur in Los Angeles and New York are discussed. The outstanding factors in Los Angeles pollution are the great number of motor vehicles in the area and the geophysical phenomena which ultimately combine to contribute to the well-known smog in the area. The problems of New York are more directly related to domestic heating, waste disposal, power production, transportation (airplanes and shipping), and air invasion (from New Jersey). Pittsburgh, which was once considered the worst example of air pollution in the nation because of the steel industry there, is cited as an example of what can be done about air pollution. In this city, there has been a reduction of 90% in homes heated by coal, gas heating having taken over. Of the vast amount of capital investment for air pollution control ($360 million up to 1964), almost $50 million involved the steel industry. The need for more research and technological development in this area, cost control, and new approaches are seen as the means of resolving the many aspects of the problem.##

04437

B. T. Commins

CHEMISTRY OF TOWN AIR. Research (London) 15, 421-6, Oct. 1962.

A review of the chemistry of urban air pollution in London and other cities is presented. Topics briefly discussed and

summarized included: sources of air pollutants; fuel combustion principles; pollutant measurements; concentrations; air pollutant properties; chemical reactions affecting air pollution. Chief sources of air pollution are seen to be fuels burnt for domestic, industrial and commercial heating, and for power generation and transportation. The more important pollutants are considered to be smoke (and associated particulate matter including H_2SO_4 and tar) SO_2, CO_2, oxides of nitrogen, hydrocarbons, and ground deposits. The more important meteorological factors affecting pollutant concentration are seen to be temperature (highest in cold weather), turbulence and wind, and temperature inversion. Factors which illustrate the differences in air pollution characteristics to be found in various cities are evident in a comparison between London and Los Angeles, the latter being more affected by vehicular exhaust contaminants and photochemical reactions than London where the atmosphere contains more heating fuel exhausts such as SO_2 and smoke.##

04584

N. Nelson

EFFECTS OF MOTOR VEHICLE POLLUTANTS. Proc. Natl. Conf. Air Pollution, Washington, D.C., 1962. pp. 54-9. 1963.

This is a brief survey of some of the effects of air pollution from motor vehicles and photochemical smog. Results of past investigations and of research being organized are also discussed.##

04595

A. T. Rossano, Jr.

THE NEEDS, OBJECTIVES, AND CAPABILITIES OF AIR POLLUTION MEASURING AND MONITORING PROGRAMS. Proc. Natl. Conf. Air Pollution, Washington, D.C., 1962. pp. 212-9. 1963.

Atmospheric pollution can precipitate or aggravate many kinds of respiratory diseases, plant and material damage, and its represents a heavy economic burden. With few exceptions, adequate means exist today for evaluating local air pollution conditions and for sharply curtailing emissions. Community air pollution is increasing at an alarming rate and it would be a serious mistake to delay positive constructive action until all the complex questions are answered. Community air monitoring and measurement practices indicate a need for greater participation on the community level, improvement in technique and instrumentation, and a freer exhange of air quality and emission information.##

05746

Gurusoff, L.

CLEANER AIR AND THE GAS INDUSTRY (PART I). Am. Gas J. 194 (3), 32-5; 38; 40; 42 (Mar. 1967).

The background of air pollution is briefly reviewed from both a universal and a gas industry viewpoint. The principal causes and sources of air pollution in the United States are discussed. The physiological effects of air pollution are considered. Current methods and means of controlling air pollution are reviewed. Regional aspects of the problem are examined as they affect its severity and bear on the attitudes of the public, the federal and local authorities, commerce, and industry, and more specifically the public utility companies.

05844

THE EFFECT OF ORGANIC MATERIALS IN THE ATMOSPHERE ON VEGETATION. Preprint. California Univ., Riverside. (This is a continuation of the report dated Jan. 21, 1957.)

A study on the effect of irradiated auto exhaust on plant damage is presented. No satisfactory amount of plant damage was produced in any of the combinations of conditions available. These included varying residence time, light intensity, plant exposure time, ratios of the auto operating cycles, and additions of nitrogen dioxide, ozone or raw gasoline. In a few experiments, very slight, but typical oxidant damage was produced along the margins of some leaves, but the amount was too small to be of use in evaluating fuels. Of particular interest is the fact that when ozone was added to the exhaust, no damage occurred. Similarly, when raw gasoline and nitrogen dioxide were irradiated ozone was formed, but no oxidant damage was obtained. No explanation for the failure to obtain plant damage can be offered until the test facilities are made available for intensive trials.##

05932

Halliday, E. C.

THE PRESENT STATUS OF RESEARCH ON AIR POLLUTION. (In: The Implications of Air Pollution Control. Vol. 1.) ((Council for Scientific and Industrial Research, Pretoria, South Africa, National Physical Research Lab.)) (Presented at the Council for Scientific and Industrial Research Conference, Durban, South Africa, Sept. 1964). p. 1-1 - 1-21. 1964.

During the last few years no development comparable with the Haagen-Smit work on the nature and causes of Los Angeles Smog, has taken place. Considerable development has taken place

in the devising of improved methods of detecting and measuring chemical pollutants in the atmosphere. The measurement of smoke and fine particulate pollutants is still a problem, for no precise monitoring method has yet been found. Considerable work has been done on the control of the emission of pollutants from industries and in particular the fabric filter has been adapted for use with hot gases and in circumstances where previously fabric filters could not be used. Studies of the effects of pollutants on man are being actively prosecuted but results are still a matter for considerable debate. Work on the dissipation of pollutants by atmospheric processes is receiving more attention than formerly. It is realized that the theoretical dissipation equations need considerable modification when city conditions are under consideration and in several places extensive measurement programmes are in hand to produce some parameters by use of which calculated dissipation figures will approach more closely to the actual experimental values. AA##

06722

A. Goetz

PARAMETERS. Symp. Environ. b8measurements, Cincinnati, Ohio, 1963. (PHS Publ. No. 999-AP-15.) (July 1964). pp. 29-34.

Air and water as gaseous and liquid components of the environment are considered essential ingredients for human, animal, and plant life -- ingredients that are also acted upon by these live forms. Air and water are evaluated in terms of chemical and physical parameters relating to their occurrence in the natural regenerative and degradative cycle and to their physiological assimiliation. Particulate pollutants and reactive gases are discussed. Emphasis is given to the physical and chemical characteristics of aerosols and their potential role as pollutants of environmental significance. (Author's summary)##

07535

W. Leithe

CLEAN AIR MAINTENANCE - AN IMPORTANT TASK FOR CHEMISTRY AND ECONOMY. (Reinhaltung der Luft - ein dringendes Anliegen fur Chemie und Wirtschaft.) Text in German. Allgem. Prakt. Chem. (Vienna), 18(8):239-241, Sept. 10-17, 1967. 4 refs.

This article is a summary of two lectures given at meetings of chemical societies. The problem of air pollution and some control methods are outlined. Typical examples of well-known air pollution problems are mentioned: London's smog chiefly caused by domestic heating, the smog of Los Angeles due to automobiles, the sun, and temperature inversions, and the industrial air pollution of the Ruhr Valley. Some characteristic data for all three examples are quoted. The

techniques for the control of dust emissions are farthest advanced. This is verified by the fact that in Germany, emission of cement dusts decreased to one third while the production of cement tripled in the last 17 years. Far less satisfactory is the control of SO2 emissions. About twice as much sulfur is blown into the air than is used for the production of sulfuric acid. Some wet and dry processes for the elimination of SO2 from smoke are mentioned, but no method is known today which is both effective and economical. The chemical industry tackled its problems mostly by reducing the emission of air polluting substances by increasing the efficiencies of the relevant chemical processes. Examples are the production of sulfuric acid and nitric acid. Organic compounds can be recovered by either absorption on activated charcoal or oxidation by catalytic afterburners.##

07845

Parker, A.

WHAT'S IN THE AIR J. Inst. Fuel, 40(315):173-175, April 1967.

We each breathe about 35 lb of air in a day, consume 3 to 4 lb of drinking water and 1 1/2 lb of dry food. This provides energy by oxidation of carbon and hydrogen of which the thermal value is about 12,000 Btu. equivalent to that provided when 1 lb of coal is burnt. Some of this energy is given out as heat, say about 400 Btu/h. Records of smogs in various countries since 1873 exist, but that in London in 1952 had great effect leading to the b8beaver Report and the b8clean Air b8act, 1956. 2.7 million ton of smoke were discharged into the air during 1938 in Britain, of which 63% was from domestic sources, 10% from railways and 27% from industry. This was reduced to 1.1 million tons in 1965, of which 0.9 million, 80%, was from domestic sources. This reduction was also helped by the rationing of coal during the years of World War II and by the desire for cleaner domestic heating methods. 4.1 million tons of sulphur dioxide were discharged into the atmosphere in Britain in 1938 and 6.4 million tons in 1965, but the concentration of SO2 in the air near the ground has stayed the same. The problem is not yet solved. About 14 million motor vehicles in the U. K. emitted perhaps 5 million tons of carbon monoxide and 1/4 million tons of hydrocarbons in 1965. The interaction of hydrocarbons, oxides of nitrogen and ozone, in sunlight causes the smogs of Los Angeles in which visibility is scarcely reduced and so they are of a different character from London smogs. The International Union of Air Pollution Prevention Associations was recently founded. Its first international clean air congress was held in London in October, 1966. (Author's abstract)##

08237

DISCUSSION ON TRENDS IN AIR POLLUTION. Arch. Environ, Health, Vol. 8, p. 31-38, Jan. 1964.

A discussion is presented, verbatim, from the 6th Annual Air Pollution Medical Research Conference held Jan. 28 - 29, 1963, in San Francisco. Among the participants were: Dr. Arie Haager-Smit (chairman); Professor Albert Bush; Dr. A. P. Altshuller; and Dr. J. T. Middleton. The topics discussed include: mortality from respiratory and other diseases in California; diesel and gasoline engine emissions; plant damage and aldehydes; cigarette smoking; and air-borne allergens.

09094

AIR POLLUTION -- A SPECIAL REPORT. Power, 48p., ((1967?)).

The results of research on each phase of air pollution are revieved. The nature of this planet's atmosphere, its natural pollutants and the mechanics of their transport are outlined. The contribution to air pollution made by man as he lives and works is described. The effects of air pollution on man's social and economic existence are examined. Constructive approaches are given to help communities meet the challenge of air pollution control effectively and economically. It is shown how intelligent plant design and location can eliminate pollution problems from the start and then how problems of existing plants can be mitigated.##

09278

National Swedish Inst. for Building Research, Stockholm, Sweden

BUILDING CLIMATOLOGY: LIST OF LITERATURE. PART II. AIR. Rept. 8, 81p., Aug. 1967.
CFSTI: PB 176776

On July 1st 1966 a department for Building Climatology was started at the National Swedish Institute for Building Research. The program for this department is to define the human requirements for indoor climate and to classify the outdoor climatological stresses in order to provide the basis for the climatological performance required for the house. To achieve this aim much basic knowledge has to be transferred from adjoining disciplines such as physiology, psychology, physics and meteorology. In order to find the basic work suitable for being carried further into applied research it is necessary to make rather extensive literature surveys. This literature survey has been focused on two important parameters of the air: air pollution and air movements. (Author's introduction)

09903

Governor's Committee on Air Resources, Minnesota
52 p., Nov. 1966. 17 refs.

MINNESOTA AIR POLLUTION: THE REPORT OF THE GOVERNOR'S COMMITTEE ON AIR RESOURCES.

Air pollution in Minnesota is discussed including the following categories of air pollution control involving politics, economics, technology and health; effects of air pollution on health, agriculture, industry and individuals; sources of air pollutants; behavior of pollutants in the air; air pollution forecast for Minnesota; legal and jurisdictional problems in control of air pollution; air pollution and law; air quality measures; and metropolitan area problems. The following legislative recommendations were made: and effective air pollution control program should utilize resources of both the state and its political subdivision; a comprehensive air pollution control program must deal with matters that emissions or ambient air quality should not be included in legislation; control programs for air pollution should not be delayed until problems are severe.

10260

Prince-Epstein, D.

STUDIES ON ATMOSPHERIC POLLUTION IN THE SOVIET UNION. ((Recherches sur la pollution atmospherique en union Sovietique.)) Text in French. Bull. Inst. Natl. Sante Rech. Med. (Paris), 23(1): 63-82, Jan.-Feb. 1968. 57 refs.

In this W.H.O.-financed survey and visit to four institutes each in Moscow and Leningrad, the state-of-the-art in Russian air pollution control is reviewed. The principal centers for research are the Institute of General and Urban Hygiene "A. N. Sysin", several medical institutes, sanitary and epidemiological stations, and other centers such as the Institute for Industrial Hygiene and Professional Diseases in Leningrad. Air pollution control consists essentially of the following measures: definition of air purity standards (much stricter than standards in America), and the determination of minimal permissible levels by means of very precise physiological tests, such as the olfactory threshold test, encephalography, and dark adaptation. Chronic tests are conducted on animals in specially designed exposure chambers, with special attention to effects on the conditioned reflexes, muscular coordination, cholinesterase activity, urinary coproporphyrins, as well as hematological, biological and other physiological data. A Russian commission was created in 1949 to determine norms for air pollutants. Principal laws promulgated by the Committee for the Sanitary Protection of the Air are: construction of industries with some provision for removal or capture of toxic substances, prohibition of emissions of dusts and toxic gases into the atmosphere, and a classification of industrial centers according to their harmfulness to health, with corresponding zones of protection between the plant and the inhabitants. The analytical methods used in the determination of CO, SO2 and H2SO4 aerosols, nitrogen oxides, ozone, and permissible levels for both daily and one-time exposures. The general results of 18 Russian studies on CO and nine studies on sulfur oxides are tabulated, and references given for work on nitrogen oxides, 3,4-benzopyrene, and ozone. The theoretical basis for the combined effects of pollutants is discussed.##

10551

Gilbert, Daniel L.

THE INTERDEPENDENCE BETWEEN THE BIOSPHERE AND THE ATMOSPHERE. Resp. Physiol. (Amsterdam), 5(1):68-77, June 1968. 50 refs.

The origin of life on earth probably occurred when there was a reducing atmosphere composed in part of hydrogen. The biosphere developed antireductant mechanisms to resist hydrogen toxicity. As hydrogen escaped from earth and the photosynthetic production of oxygen began, the atmosphere changed to an oxidizing one composed in part of oxygen. The oxygen in the atmosphere gradually increased until it reached its present value. As a consequency of the presence of oxygen, the biosphere continuously developed antioxidant mechanisms. Organisms which developed antioxidant mechanisms under relatively high oxygen concentrations and then migrated to environments of lower oxygen concentrations would possess an advantage in having very well developed antioxidant mechanisms for their low oxygen environment. The atmosphere is being changed today by the activities of man. It seems that carbon dioxide is increasing. Eventually, it is speculated that due to the continued dehydrogenation of the earth, the atmosphere will be composed of only carbon dioxide and molecular nitrogen. It is further speculated that life will not be able to survive on earth at this time. (Author's abstract)##

10788T

Harries, C. and K. Langheld

THE BEHAVIOR OF PRODUCTS OF PROTEIN CLEAVAGE AND OF SEVERAL SUGARS TOWARD OZONE. ((Uber das Verhalten der Eiweissspalt-produkte und einiger Zuckerarten gegen Ozon.)) Translated from German. Z. Physiol. Chem., 51:372-373, 1907. 10 refs.

The chemical effects of ozonization on the fatty products of protein cleavage (glycocol, alamine, leucine, serine, asparagine, guanidine) are experimentally explored. No oxidation products for these substances could be detected. Ozonization of aromatic cleavage products (phenyl-alanine, tyrosine, and tryptophan) is also explored. Derivatives were found after ozonization of these last three compounds. Chemical properties of the derivatives and cleavage of the benzene ring to yield these products are discussed. Chemical properties of compounds derived from the oxonization of sugars (dextrose, mannitol, and dulcitol) are described.##

12177

John T. Middleton

AIR QUALITY AS A CONTROLLING FACTOR IN LIFE PROCESSES. In: Biometeorology, Proceedings of the Twenty-Eighth Annual

Biology Colloquium, 1967, William P. Lowry (ed.) p. 67-79, 1967. (4) refs.

The quality of air is determined by the uses made of it and by the pollutants injected into it by man. The quality of air varies for a number of reasons, but principally because of contaminants arising from economic and social developments throughout the world. Air pollution is one of the undesirable side effects of this growth and development. The extent, severity, and character of man-made air pollution are determined by the kind, number, and location of contaminant sources, the chemical reactivity and interaction of the pollutants, the topography of the land, the weather, the nature of the community, and the characteristics of the airshed.##

13182

Slonim, N. Balfour and N. Karen Estridge

OZONE - AN UNDERESTIMATED ENVIRONMENTAL HAZARD. Environ. Health, 31(6):577-578, May/June 1969.

The widespread use of ozone has lead to increasing exposure to this gas. Equipment producing sparks, arcs, or static discharge, as well as ultraviolet or other ionizing radiation, produces ozone from molecular oxygen. Commercially available "air purifiers", and "deodorizers" in homes, hospitals, offices, elevators, and meat storage plants generate sufficient ozone to be hazardous under certain conditions of use and ventilation. The biochemical mechanism of ozone toxicity is under active investigation. Free radicals are probably the basic biochemical mechanism of ozone-induced cell damage. Ozone destroys sulfhydryl-containing compounds, and in this process free radicals may be produced. However, a more important theory of ozone toxicity involves an oxidative attack on the carbon-carbon double bond of unsaturated fatty acids, i.e., lipid peroxidation.

13494

Dryden, I. G. C.

CHEMICAL CONSTITUTION AND REACTIONS OF COAL. In: Chemistry of Coal Utilization, Supplementary Volume, H. H. Lowry (ed.), National Academy of Sciences, Washington, D. C., Committee on Chemistry of Coal, p. 232-295, 1963. 392 refs.

Various methods of determining the chemical composition of coal are surveyed. Solvent extraction yields little information about the coal molecule, apart from a molecular weight distribution. If solvent extracts contain more than 1 to 5% of the parent coal, they resemble it closely, provided they are prepared below 250 C. If prepared above this temperature, pyrolysis has clearly modified

their composition. The best specific solvents for coal contain a nitrogen atom with a readily available pair of electrons. Evidence from polarography has suggested that certain nuclei containing one, two, and three rings play an important part in coal structure. X-ray histograms suggest that about one-half of the carbon in the nuclei is almost equally distributed between one, two, and three rings, but these estimates may be biased toward the larger ring systems. In the polarography of coal extracts, the frequent occurrence of half-wave potentials, for the reduction of aromatic systems, points to the presence of a considerable proportion of biphenyl, naphthalene, phenanthrene, and triphenylene structures. The extent of reduction suggests a minimum polycyclic aromaticity between 0.35 and 0.5. Methods of functional group analysis and polarography at lower potentials have shown that the hydroxyl and carbonyl group concentrations account for 70 to 90% of the O2 in bituminous coal. Hydrogenation, extensive oxidation, hydrolysis, pyrolysis, and fluorination are the most interesting reactions of coal, but furnish only limited information about the structure of coal itself.

13952

Lindberg, Walter

AIR POLLUTION IN NORWAY. I. THE GENERAL AIR POLLUTION IN NORWEGIAN CITIES AND INDUSTRIAL TOWNS. (Den alminnelige luftforurensning i Norge. I. Generelt om luftforurensning i byer og tettbygde strok.) Translated from Norwegian [illegible]slo Univ. (Norway), p. 1-65, 1968. 12 refs

General information is presented on air pollution in Norway with attention focused on (1) the sources and types of pollutants: motor vehicles, heating plants, incinerators, (2) air pollution levels in the cities, including dustfall, SO2, and smoke measurements in Oslo, Sweden, (3) special investigations (sulfuric acid fog), the chemical composition of solid particulates in smoke and suspended dust, polynuclear hydrocarbons and particulates, trace elements, (4) pollutants in Norwegian cities other than Oslo, (5) directions for medicohygienic evaluation of pollution levels in cities and other densely populated districts and industrial regions, and (6) an evaluation of the economic consequences of air pollution.

16251

Haagen-Smit, A. J.

AIR CONSERVATION. Science, 128(3329):869-878, Oct. 17, 1958. 11 refs.

At the present time, air pollution control is concerned with pollutants present in concentrations of a few parts per million; in the future, it will need to consider the removal of pollutants

present in quantities smaller by a factor of ten. Effective cleaning procedures will require advances in the field of engineering and in theories of inorganic, physical, physiochemical, and photochemical processes. In addition, solutions will be needed for legal and economic problems, as well as those involving the physiology and pathology of plants and animals. The complexity of air conservation problems is illustrated by smog, which contains ozone concentrations 20-30 times higher than those present in unpolluted air, where the normal amounts are 1-3 pphm. It may take years to unravel relatively simple reactions, such as the photodecomposition of acetone, biacetyl, etc., that contribute to ozone formation. In the air, these reactions are complicated by the presence of oxygen, water, carbon dioxide, and other compounds from the evaporation of gasoline and the burning of trash. The application of new methods of calculating pollution distribution and movement would permit determination of the future development of smog at different locations and a comparative analysis of the effects of removing different pollutant sources. To establish valid pollution levels, more epidemiological studies must be undertaken.

16878

Commoner, Barry

EVALUATING THE BIOSPHERE. Science J., 5A(4):67-72, Oct. 1969.

The biosphere--the earth's thin skin of air, water, and soil--provides the necessities of life for man. At the same time, the impact of man's technological developments has been felt increasingly by the biosphere. From an evaluation of some of the effects of modern technology on the biosphere, it is shown that technology as it is currently construed forms an intrinsically unstable relationship with the biosphere. Since the stability and integrity of the biosphere are essential for the continued operation of technology, the present situation represents a threat to the survival of our present system of technology, and, indeed, of man himself. A further discussion of this unstable relationship is presented.

17260

CHEMICAL ASPECTS OF ATMOSPHERIC POLLUTION. (Les aspects chimiques de la pollution atmospherique). Text in French. Ind. Chim. Belge, 34(9):739-744, 1969. 21 refs. (Presented at a Symposium Sponsored by the International Union of Pure and Applied Chemistry, Cortina d'Ampezzo, Italy, July 9-10, 1969.)

The symposium papers to be published in the journal 'Pure and Applied Chemistry' covered the following topics: the toxic aspects of atmospheric pollution and recommended limits on

concentrations of 24 pollutants; a method of determining the surface area of very small particles; simple methods of separating aerosols by particle size; the influence of certain substances on the transport of hydrohysable ions; the deletorious effect of fluorides on the flora and, indirectly, on the fauna as well; techniques for sampling, isolation, and quantitative analysis of F compounds; different varieties of 'smog'; a method for correcting benzo(a)pyrene determination for the concomitant benzo(k)fluoranthene; polycyclic aromatic hydrocarbons in the exhaust gas of internal-combustion engines; applications of analytic methods for determining polycyclic compounds; several methods of determination of Pb compounds in air; and a survey of the distribution of traces of pollutants in the atmosphere. Oxygen obtained by distillation of liquefied air is polluted by automobile-exhaust and industrial waste gases. The application of the interface electrode of extremely high sensitivity in air pollution studies and the use of mathematical models in air pollution investigations which would reduce the cost and expenditure of time required for an extensive test program were also covered.

18005

Hinch, Nylds

AIR POLLUTION. J. Chem. Educ., 46(2):93-95, Feb. 1969. 4 refs.

The consideration of the air we breathe has been one of the most fundamental and profitable endeavors in scientific, philosophical, and medical thought. This is a discussion of the historical aspects of air pollution. Many of the specific substances that have been identified as air pollutants are discussed briefly.

B. EMISSION SOURCES

00023

F. E. Gartrell, F. W. Thomas, S. B. Carpenter, F. Pooler, B. Turner, and J. M. Leavitt

FULL-SCALE STUDY OF DISPERSION OF STACK GASES (A SUMMARY REPORT) Tennessee Valley Authority, Chattanooga, Division of Health and Safety, and Public Health Service, Cincinnati, Ohio, Division of Air Pollution. Aug. 1964. 110 pp.
CFSTI: PB 166679

During fiscal years 1958-1962, the Tennessee Valley Authority conducted an air pollution research project under the sponsorship of the Public Health Service. In this project, advantage was taken of unique opportunities for full-scale appraisal of dispersion of air pollutants from large coal-burning, steam-electric generating plants. Advantages offered for diffusion studies included: (1) large isolated sources where intermixture with extraneous pollutants is not significant; (2) complete plant operational data and emission rates; (3) sufficient fly ash emission to provide a visible plume aloft out to distances of 10-15 miles under metecrological conditions of special interest; (4) a helicopter equipped with special instruments for sampling and recording SO2 concentrations, as well as extensive auxiliary instruments; (5) tower-mounted meteorological instruments for providing basic information on wind and temperature parameters; and (6) computer facilities for data analysis. In addition to the primary studies to determine diffusion parameters, a limited investigation was made of plume rise or effective stack heights. An extensive investigation was made of the oxidation of SO2 in the atmosphere after emission from the stack. Oxidation was studied with ground-based facilities and also in the plume at various distances and travel times, and under various weather conditions. In the course of this investigation interrelationships among SO2, H2SO4, and fly ash also were studied.##

00024

V. G. MacKenzie

THE POWER INDUSTRY AND AIR POLLUTION. Public Health Service, Washington, D.C., Div. of Air Pollution, Nov. 28, 1962. 12 pp.

The relation between the power industry and air pollution is discussed concerning its role in meeting high energy production and

its obligation toward meeting the national problem of air pollution. The following topics are discussed: (1) nature of power industry emissions, (2) the sulfur dioxide problem, (3) means of controlling emissions, and (4) control of nitrogen and sulfur oxides. (A paper based on remarks made by V. G. MacKenzie at the 1962 Annual Meeting, Association of Edison Illuminating Companies, Boca Raton, Fla., Nov. 28, 1962.)##

00027

A. H. Rose, Jr., M. Corn, R. R. Horsley, D. R. Allen, and P. W. Kolp

AIR POLLUTION EFFECTS OF INCINERATOR FIRING PRACTICES AND COMBUSTION AIR DISTRIBUTION. J. Air Pollution Control Assoc. 8(4):297-309, Feb.1959.

The relationships between incinerator design criteria and resulting atmospheric contaminant discharges were investigated. Tests were made by burning a fuel of constant composition in a prototype, multiple-chamber incinerator under controlled conditions. Effects of variables were measured by analyzing the flue gases for solids, hydrocarbons, oxides of nitrogen, and CO. The series of tests reported was made to (1) provide information on the relative importance of such variables as stoking and amount of fuel per charge insofar as they affect the production of atmospheric pollutants, and (2) evaluate the chosen levels of variables such as excess combustion air, underfire and secondary air distribution, and fuel charging rate. Production of particulates was highly dependent on the amount of excess combustion air and the percentage of this air entering under the fuel bed. At the 50% excess air level, particulate discharge increased when underfire air was increased from 15% to 30% of the total combustion air. This did not hold true for the 150% excess air level. Reduction of hydrocarbons and CO appeared to be more dependent on the level of excess combustion air available than on its distribution between overfire, underfire, and secondary air. These pollutants were produced under combustion with 50% excess air but not with 150% excess. Production of oxides of nitrogen depended on the rate of fuel charging, the amount of excess air, and the gas temperature in the ignition zone. (Author)##

00030

W. S. Smith

ATMOSPHERIC EMISSIONS FROM FUEL OIL COMBUSTION (AN INVENTORY GUIDE). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, (999-AP-2.) Nov. 1962. 102p.

This review provides a guide for the inventorying and control of emissions arising from the combustion of fuel oil. Information was collected from the published literature and other sources.

The report is limited to information on oil used as a source of heat or power (exclusive of process heaters). The data were abstracted, assembled, and converted to common units of expression to facilitate understanding. From these data, emission factors were established that can be applied to fuel oil combustion to determine the magnitude of air-contaminating emissions. Also discussed are the compositions of fuel oils; the preparation and combustion of fuel oil; and the rates of emission, their variables, and their control. (Author) ##

00052

MOTOR VEHICLES, AIR POLLUTION AND HEALTH (A REPORT OF THE SURGEON GENERAL TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 86-493, THE SCHENCK ACT). Public Health Service, Washington, D.C., Div. of Air Pollution. June 1962. 463 pp.

"Motor Vehicles, Air Pollution, and Health" is a report prepared by the Division of Air Pollution of the Public Health Service as directed by the Congress in Public Law 86-493. The Report is presented in three parts as follows: Part I. Summary--A Review of the Problem; Part II. Effects of Motor Vehicle Pollution on Health; Part III. Air Pollution from Motor Vehicles. Part I summarizes current information and theories of the nature of air pollution resulting from emissions from motor vehicles. It also examines approaches to the reduction of such pollution, and some of the problems associated with control measures. Finally, it presents an appraisal of the biological effects, proven or potential, of such pollution. Part II reviews, in detail, information which has been reported concerning the influence of air pollution on health, with particular reference to the effects from pollution arising from the operation of motor vehicles. The results of mortality and morbidity surveys, of laboratory research, and of other pertinent investigations are given. The responses of vegetation and animals, as well as of humans, to individual contaminants as well as to mixtures, such as are encountered in the atmosphere, are examined. Part III describes, in some detail, how motor vehicle operation elates to emissions of pollutants, the magnitude of the pollution problem, the nature of chemical reactions in the atmosphere, factors affecting concentrations, methods for reducing pollution, and the subject of ambient air and emission standards. ##

00081

R.T. Arnest

ATMOSPHERE CONTROL IN CLOSED SPACE ENVIRONMENT (SUBMARINE). Naval Medical Research Lab., New London, Conn., Bureau of Medicine and Surgery, (Rept. No. 367.) Dec. 14, 1961. 39 pp.
CFSTI, DDC: AD 270896

The purpose of this work was to make a general summary of the toxicological problems associated with the closed space environment of submarines and to review the current state of development of tools for measuring and removing the problem substances involved. More than twenty-five atmospheric contaminants are listed, their sources, and their maximum allowable concentrations (MAC) are given, as well as the symptoms they cause, the long-term effects; tools for measuring the amounts of contaminants present are described and methods of removal indicated, in so far as known.##

00109

A. P. Altshuller

REACTIVITY OF ORGANIC SUBSTANCES IN ATMOSPHERIC PHOTOOXIDATION. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. (999-AP-14.) July 1965. 29 pp.

The organic vapors emitted to urban atmospheres by motor vehicles and other sources of emissions consist not only of paraffinic, acetylenic, aromatic, and olefinic hydrocarbons, but also of aldehydes, ketones, alcohols, phenols, and chlorinated hydrocarbons. To estimate the contribution of each of these classes of compounds to photochemical smog, one must know both their atmospheric concentrations and their relative reactivities in atmospheric reactions. A review of the available literature on concentration levels of organic vapors in urban atmospheres indicates that much more analytical work is needed. The existing data are adequate, however, for the formulation of useful estimates. Reactivities of organic substances in photooxidation reactions can be considered from many standpoints. Rates of disappearance of the organic substances, rates of disappearance of nitric oxide or of formation and disappearance of nitrogen dioxide, and rates or maximum yields of various products such as oxidant or organic nitrates all can be used as chemical measurements of reactivity. Eye irritation, various types of plant damage, and aerosol formation are indicators of reactivity that can be related only to a limited extent to chemical measurements of reactivity. The problems of developing a single index of reactivity are considered. The application of reactivity measurements to automobile exhaust composition, to control devices, and to improvements in atmospheric purity is discussed. (Author)##

00140

J. H. Fernandes, J. D. Sensenbaugh, and D. G. Peterson

BOILER EMISSIONS AND THEIR CONTROL. Combustion Engineering, Inc., Windsor, Conn., and Air Preheater Co., Wellsville, N.Y. (Presented at Conference on Air Pollution Control, Mexico City, Apr. 28, 1966.)

Emissions from combustion sources that are significant from the standpoint of air pollution include (1) particulate matter, (2)

sulfur oxides, and (3) nitrogen oxides. Particulate matter is objectionable on esthetic grounds. The technology for its control well developed, although effort is constantly being made to improve collection equipment and reduce the cost of a nonproductive operation. Techniques have been developed for control of SO3 in oil-fired units by means of low-excess air and additives. Methods for control of SO3 in coal-fired boilers have not been as well developed as for oil-fired units, but there is less SO3 present with coal firing. A great deal of work has been done on control of SO2, both by fuel desulfurization and by removing the SO2 from the stack gas. Oxides of nitrogen are important as air pollutants because of their participation in the reactions leading to photochemical smog. Since the localities most subject to photochemical smog are in oil and gas burning areas, most of the work has been done on these fuels. The emission of oxides of nitrogen can be significantly reduced by using gas fuel or by use of a suitable firing method and low-excess air with oil fuel.##

00186

J. H. Ludwig

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. 1966. 52 pp.

The contribution of motor vehicle emissions to community-wide air pollution is discussed and related to other factors involved in air pollution such as commercial and industrial sources, the size of the community and source distribution, topographical and meteorological factors, and the degree of control exercised on the sources. In particular, one section of the publication analyzes the different pollutant types emitted from diesel and gasoline engines. Another section discusses the photochemical reactions in the atmosphere known to produce air pollutants.##

00220

J. P. Sheehy, J. J. Henderson, C. I. Harding, and A. L. Danis

AIR POLLUTION IN JACKSONVILLE, FLORIDA (A PILOT STUDY - AUG.-SEPT. 1961). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution (AP-3). Apr. 1963. 65 pp.
GPO: 802-899-6

The objectives of this pilot study were: (1) To develop a preliminary opinion as to whether the city of Jacksonville has a generalized air pollution problem. (2) To determine whether certain pollutants - fluorides and SO2, were present in the atmosphere in concentrations capable of producing the damage to vegetation that had been experienced in the Jacksonville-Duval

County area. To accomplish the first objective, a one-week intensive investigation was carried on in downtown Jacksonville, at (emming Park, from August 3 to 10, 1961. To accomplish to second objective, additional studies were conducted during the periods August 4 to 12, and September 5 to 13, 1961, in the area in which damage to vegetation had occurred. The two fertilizer plants, located in the industrial area of Jacksonville, were not in production during the first phase of this study. Pollutants sampled in this study included fluorides, SO2, H2S, NO2, nitrogen dioxide, and particulates. As a result of the investigations it was concluded that: (1) Photochemical smog was being produced in the air over Jacksonville. (2) Concentrations of fluorides occurred in certain parts of Jacksonville during the period of the study that could cause damage to sensitive plants. (3) Pollutants from the city of Jacksonville can be transported across the St. John's River. H2S concentrations measured during this study were not of the magnitude known to cause discoloration of paints containing lead pigments and/or mercury base fungicides. Subsequent to the study, an incident of darkening of paints occurred in the arlington area. Therefore, it is evident that an H2S problem exists in this area. SO2 concentrations observed during this study did not reach levels known to cause damage to vegetation. However, it appears possible for SO2 concentrations to reach levels during the heating season capable of causing damage to sensitive plants, particularly in localized areas downwind of major sources of SO2.##

00250

L. C. McCabe and J. S. Lagarias

AIR POLLUTION AND THE PAINT INDUSTRY. J. Paint Technol., 38(495):210-216, Apr. 1966. (Presented at the 43rd Annual Meeting, Federation of Societies for Paint Technology, Atlantic City, N. J., Oct. 29, 1965.

The manner in which regulations on gaseous and particulate emissions affect the paint industry is reviewed with special emphasis on proposed new legislation concerning solvent emissions. Factors which influence the establishment of emission standards and ambient air quality are discussed. The inconsistencies from community to community on emission standards do not appear to be related to meteorological or local conditions. It is suggested that the setting of standards for air quality should depend upon establishing the effects of air pollutants on humans, animals, and vegetation as well as economic and meteorological considerations. A review of existing codes shows that this has not always been done. In the case of organic solvents, proposed legislation could result in substantial changes in the use of certain solvents.##

00271

W. F. McMichael and J. E. Sigsby, Jr.

AUTOMOTIVE EMISSIONS AFTER HOT AND COLD STARTS IN SUMMER AND

WINTER. J. Air Pollution Control Assoc., 16(9):484-488, Sept. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 22, 1966.)

The U. S. Public Health Service, as part of its continuing investigations of automotive emissions, began a study early in 1965 to determine the effects of hot-start and cold-start engine operation on exhaust emissions. This study was conducted in the Cincinnati area in summer and winter ambient temperatures. The effects of hot and cold starts on the mass and composition of exhaust gases were compared. Emissions from the test vehicles were measured in actual traffic with a proportional sampler. The test route was developed in earlier work to represent average urban driving conditions. Data from this study reflect the effects of traffic density, route, and climate on hot-start and cold-start engine operation. (Authors' abstract)##

00324

G. C. Hass, F. Bonamassa, P. Heward, N. Kayne

THE INFLUENCE OF VEHICLE OPERATING VARIABLES ON EXHAUST EMISSIONS. J. Air Pollution Control Assoc. 17(6) 384-7, June 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Assoc., San Francisco, Calif., June 20-24, 1966, Paper No. 66-69.)

This paper is a report of the operating variables and emission characteristics of a 1964 283 cubic inch V-8 Chevrolet automobile. This vehicle was used as a laboratory tool in a project to develop an improved driving cycle to represent Los Angeles peak hour driving. As a result it became necessary to run many expoloratory tests to determine the relationships between the primary variables of intake manifold vacuum, engine rpm, and vehicle speeds and acceleration rates. Emissions of hydrocarbons, carbon monoxide, and nitrogen oxides were also determined for the entire range of operating conditions. The effect of prior operating modes on closed-throttle unburned hydrocarbon concentrations was also determined. The results of these tests are presented in tables and graphs which make a comprehensive picture of one typical automobile as a generator of air pollutants. (Author's abstract)##

00325

J. N. Pattison and M. P. Sweeney

A STUDY OF LOS ANGELES DRIVING AS IT RELATES TO PEAK PHOTOCHEMICAL SMOG FORMATION. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-68.)

In order to characterize driving as it affects smog formation, the philosophy of having adequate control of smog peaks was chosen. Vehicle emissions during the morning rush hour in downtown Los Angeles in the fall were found to be responsible for the largest smog peaks. A study was made of this type of driving, using a single 1964 Chevrolet that was instrumented to record its operating conditions. Using this mode data obtained, a street route was developed on which this same car reproduced in adequate detail the operating conditions found in the traffic study. The street route can then be used to compare the effect of various vehicles on emissions, and thereby derive an adequately based dynamometer cycle which correlates therewith. (Author)##

00337

W. R. Crouse and N. E. Flynn

SOURCE INVENTORY IBM SYSTEM FOR PARTICULATE AND GASEOUS POLLUTANTS. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-10.)

A source inventory IBM system of air pollutants is described which makes use of an existing IBM card index-registration system in an established air pollution control district and which employs efficient utilization of engineering time, including computer services, to establish and maintain current a detailed source inventory of point sources of emissions. An emission inventory specifies the (1) amounts, and (2) sources of air pollution in a community. The knowledge of air pollution can be relegated to three simple questions: (1) "What" the pollution problem is in terms of primary air pollutants, (2) the "where" of the problem -- i.e., a description of the industrial, commercial, or domestic sources by tabulation of either (a) types and location of basic equipment discharging pollutants, (b) a description in broad source categories of industry, or (c) actual tabulation of locations of plants in the community, and (3) the "how much" or extent of air pollutants. In the case of gases, namely organic compounds, the oxides of nitrogen and sulfur, and CO, future regulation and enforcement of invisible gaseous emissions requires an inventory which predetermines or estimates levels of emissions and directs enforcing officers or inspectors to point locations. This capability is discussed as well as the description of the method of construction of a recent source inventory, calculated on the basis of average emission factors and known plant throughput data and plant locations (registered plant equipment).##

00464

C. F. Ellis

CHEMICAL ANALYSES OF AUTOMOBILE EXHAUST GASES FOR OXYGENATES. Bureau of Mines, Washington, D.C. (Rept. of Investigations No. 5822). 1961. 39 pp.

This report presents procedures for chemical analyses of certain oxygenated compounds, procedures for sampling the exhaust gases for these analyses, and the analytical results of some experimental work in which these procedures were used. A stationary 1956 model, 170 horsepower, V-8, dynamometer-mounted engine, operated to simulate vehicular cruise conditions, was used for the study. Exhaust gsees produced from a regular-grade Midcontinent gasoline during 15- , 40- , and 60-mile-per-hour cruise operations were analyzed by chemical methods for formaldehyde, total aldehydes, total carbonyls, total alcohols, carvon associated with the oxygenated compounds, and the oxides of nitrogen. Experimental results indicate: (1) The range of concentrations of the total of the functional groups of oxygenated compounds, expressed as moles per million moles of water-free exhaust gases, is about 90-100; the concentrations increase with engine speed; (2) Aldehydes comprise about 80-90 mole-percent of the total of the oxygenated groups, and formaldehyde accounts for about 50 mole-percent of the total aldehydes; (3) The order of magnitude of the concentration of the carbonyls is the same as that for the aldehydes, indicating that ketones are not a major group. A colorimetric test indicates that methyl ketones consititute about 2 mole-percent of the oxygenated compounds; (4) The concentration of the alcohols is of the order of 10 mole-percent of the oxygenated compounds; (5) The total carbon associated with the oxygenated compounds is about 175 moles per million moles of water-free exhaust gas for all 3 speeds; and (6) The concentration of N oxides, expressed as moles of NO2 per million moles of water-free exhaust gas, is about 150, 1,600, and 2,800 at 15, 40, and 60 miles per hour, respectively.##

00504

D.A. Jensen

SEPARATING FACT FROM FICTION IN AUTO SMOG CONTROL. Arch. Environ. Health, 14(1):150-155, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

Author gives a status state-of the -art summary of the various sources of emissions from automobiles. Topics covered are: crankcase emission controls; servicing and maintenance; requirement of a "closed" system or one equally effective, exhaust emission controls; evaporative emissions; oxides of nitrogen emission controls; diesel smoke and odor emission controls; cars and fuels of the future. In addition, author discusses the impending vehicle emission control which will be put into effect for 1968 motor vehicles.##

00673

H.H. Hovey, A. Wisman, J.F. Cunnans

THE DEVELOPMENT OF AIR CONTAMINANT EMISSION TABLES FOR NONPROCCESS EMISSIONS J. Air Pollution Control Assoc.

Vol. 16(7):362-366, July 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-17.)

In New York State, the calculation of air contaminant emissions from a variety of sources is an essential part of comprehensive air pollution studies. The tables used to calculate emissions were obtained from an extensive literature search and modified to apply to New York State conditions. For example, sulfur dioxide emission factors for coal were selected to reflect the average sulfur content of the coal sold in New York State. Since the literature contains a wide array of emission factors,##

00679

W. E. Jackson

AIR POLLUTION FROM AUTOMOBILES IN PHILADELPHIA. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-137.)

This report has been prepared with the objectives of describing the problem created by automobiles in Philadelphia and recommending the action which must be taken. The action recommended is as follows: (1) Positive crankcase ventilation systems and exhaust control systems should be required on all new cars registered in Pennsylvania. A well planned program of controlling only the new cars with factory installed devices will minimize the problem over a ten year period. If initiated immediately, this reasonable approach would eliminate the need for a crash program at some future date. All mechanical devices require maintenance to insure proper and efficient operation; and (2) The State-wide inspectional system should require a maintenance check of all appropriate parts of the automobiles to insure satisfactory operation (as related to pollution emissions) and to reject those cars with visibly excessive exhaust emissions. This should apply to both new and used automobiles and all other types of motor vehicles.##

00693

G. Walker

EQUILIBRIUM DISTRIBUTION PATTERNS OF THE COMBUSTION PRODUCTS OF A GASOLINE ENGINE OPERATING ABOUT THE STOICHIOMETRIC CONDITION. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-18.)

The operation of a C.F.R. internal combustion engine was simulated on a digital electronic computer. A study was made of the effect of variation in the air-fuel ratio on the equilibrium

distribution patterns of combustion products at the end of the expansion stroke. The combustion products were assumed to consist of 10 chemical species at instantaneous equilibrium during both the finite combustion period and subsequent expansion. The equilibrium composition of the 10 species throughout the whole period is presented graphically for six different air-fuel ratios both greater and less than the stoichiometric value. Other parameters of engine performance, including thermal efficiency, m.e.p., work done per cycle and the heat transferred, are given for the same air-fuel ratios.##

00798

R.I. Larsen

VEHICLE EMISSIONS AND EFFECTS, A SUMMARY OF THE DECEMBER 1961 AIR POLLUTION RESEARCH CONFERENCES. Preprint. (Presented at the New England Section Annual Meeting, Air Pollution Control Association, Worcester, Mass., Apr. 25, 1962).

In December 1961 air pollution research findings to that date were presented at two conferences held in Los Angeles. The conferences were the Fifth Air Pollution Medical Research Conference and the Joint Research Conference on Motor Vehicle Emissions and Their Effects. A few highlights follow. Air pollution damages plants, animals, and property, and is harmful to people. Plant damage in the United States exceeds $25 million per year. Present community air pollution levels weaken an individual's resistance to respiratory diseases such as colds, pneumonia, and lung cancer. Smoking and air pollution age and deteriorate lungs. In one study, smokers' lungs aged 50% faster than non-smokers' lungs. In another study, 90% of heavy smokers (more than two packs per day) had respiratory disease. The disease rate for several respiratory ills was 3 to 5 times greater in these heavy smokers than in individuals who had never smoked. The death rate from emphysema (deteriorated lungs) has increased 400% in the last 10 years. A recently identified photochemical pollutant, peroxyacyl nitrate (PAN), at concentrations as low as 5 parts per billion (ppb), damages plants. It is quite possible that this pollutant is responsible for most "oxidant-type" damage in Los Angeles. Five times as much exhaust gas from low-olefin fuel was required to produce similar damage. Russian air quality standards probably have at least one present use in the United States.
In a given community, pollution concentrations that do not exceed the Russian standards tentatively could be considered to not be problems. The contribution of the internal combustion engine to smog could be reduced significantly by improved carburetor design, improved production control, and imporved carburetor and ignition system maintenance. If the conventional engine without an afterburner is considered beyond redemption, a lean-fuel engine (such as gas urbine, stratified charge, or diesel) could be used to meet present emission standards. If an automobile that does not contribute to smog is to be achieved, a new sense of mission, a lot more money, and additional competent researchers will be required. (Author abstract modified)##

00858

R. Venezia G. Czolins

INTERSTATE AIR POLLUTION STUDY - PHASE II PROJECT REPORT. II. AIR POLLUTANT EMISSION INVENTORY. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. May 1966. 54 pp.

An emission inventory was conducted 1963-1964 as part of the St. Louis - East St. Louis Interstate Air Pollution Study. The Study covered an area of 3,567 square miles and included the City of St. Louis and the six surrounding counties - St. Louis, St. Charles, and Jefferson Counties in Missouri and Madison, St. Clair, and Monroe Counties in Illinois. More than 95% of the population and almost all of the industrial activity are located in the 400 square miles of the centrally located urbanized part of the Study area. The pollutant emission data presented can be almost entirely atrributed to this urbanized portion of the area. Population density and land-use maps, which provide an excellent index to the areal distribution of most pollutant emissions, are also presented. The pollutants considered in this survey are those emitted in large quantities from a variety and multitude of sources dispersed throughout the area.##

00892

W.D. Norwood, D.E. Wisehart, C.A. Earl, F.E. Adley, D.E. Anderson

NITROGEN DIOXIDE POISONING DUE TO METAL-CUTTING WITH OXYACETYLENE TORCH. J. Occupational Med. 8(6):301-306, June 1966.

Several hours after the use of an acetylene torch for metal-cutting in a poorly ventilated water main, a worker became so short of breath that he could not sleep. He reported to the plant physician 18 hr. after the exposure and an X-ray film revealed pulmonary edema. Reenactment of the event produced a level of nitrogen dioxide of 90 ppm in 40 min., the total oxides of nitrogen being in excess of 300 ppm. Such a level might well be expected to produce pulmonary edema. The accident was typical of the insidious action of nitrogen dioxide, which can so easily occur under some conditions and may cause death. Recognition of the latent period between exposure and the development of pulmonary edema, timely treatment with bed rest, and, if necessary, the administration of oxygen under pressure can be life-saving. A greater awareness of the sources and toxicity of nitrogen dioxide is also needed to prevent unnecessary exposure. (Author summary)##

00962

R. I. Larsen

AIR POLLUTION FROM MOTOR VEHICLES. Ann. N. Y. Acad. Sci., 136(12):275-301, Aug. 26, 1966. (Presented at a meeting of the New York Academy of Sciences, April 6, 1966.)

Motor vehicles are a major source of urban air pollution. They emit carbon monoxide that reduces man's ability to transport oxygen to his tissues; lead that increases man's body burden of this toxic metal; cancerigenic hydrocarbons; and reactive hydrocarbons and nitrogen oxides that combine with sunlight to produce eye-irritating, plant-damaging, visibility-obscuring photochemical smog in New York as well as in California. Present and predicted air pollutant concentrations are compared with pollutant effects and air quality standards. Emission-reduction features presently used in new cars sold in California will improve air quality, but will not completely solve the problem. Indications are that 95 percent reduction in emissions of carbon monoxide, hydrocarbons, and nitrogen oxides from new cars sold in the United States may be needed by 1975. Such a "clean-air car" by 1975 is suggested as a research goal for automobile manufacturers. At present, improved fuel cells or improved battery power seem to be the most likely means for achieving this goal. (Author abstract)##

00969

P. A. Leighton

MAN AND AIR IN CALIFORNIA. Preprint. (Presented at the Statewide Conference on Man in California, 1980's, Sacramento, Calif., Jan. 27, 1964.)

Author discusses polluted air in respect to automobile emissions and projects the concentrations that can be expected by 1980. Presented are charts and tables which easily delineate the salient points of the article.##

01002

E. S. Starkman, H. K. Newhall, R. Sutton, T. Maguire, and L. Farbar

AMMONIA AS A SPARK IGNITION ENGINE FUEL: THEORY AND APPLICATION. California Univ., Berkeley. (Presented at the Society of Automotive Engineers Congress, Detroit, Mich., Jan. 10-14, 1966, Paper No. 660155.)

Anhydrous ammonia has been demonstrated to operate successfully as a fuel for spark ignition engines. Principal requirements are that it be introduced in the vapor phase and partly decomposed

to hydrogen and nitrogen. Spark timing for maximum performance must be advanced slightly for ammonia but sensitivity to spark timing is little greater than with hydrocarbons. Increasing the cylinder wall temperature aids in effecting successful and reliable operation. The maximum theoretically possible indicated output using ammonia vapor is about 77% of that with hydrocarbon. Specific fuel consumption increases twofold at maximum power and 2-1/2 fold at maximum economy when using ammonia as a replacement for hydrocarbon. (Author abstract)##

01076

E. F. Darley, P. R. Burleson, E. H. Mateer, J. T. Middleton, and V. P. Osterli

CONTRIBUTION OF BURNING OF AGRICULTURAL WASTES TO PHOTOCHEMICAL AIR POLLUTION. J. Air Pollution Control Assoc. Vol. 16(12):685-90, Dec. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966.)

Agricultural wastes from orchards, grain fields, and range lands are burned each year in California as the most practical means of ridding the land of these wastes. In order to determine the relative contribution of the burning of such material to photochemical air pollution, the effluent from 123 fires of known weights of range brush, both dry and green, barley and rice stubble, and prunings from various fruit and nut trees were monitored in a special tower which provided an open burning situation. Analyses were made for total hydrocarbon, expressed as C, by flame ionization detection, and for 24 individual hydrocarbons by gas chromatography, as well as for CO and CO2 by infrared spectroscopy. A few analyses were made for oxides of nitrogen. These data, coupled with temperature and airflow measurements, allowed calculations to be made on pounds of effluent per ton of material burned and demonstrated that the emissions from agricultural burning are much less than those from the automobile, a principal source of such emissions. (Author abstract)##

01228

L. Rispler and C. R. Ross

VENTILATION FOR ENGINE EXHAUST GASES. Occupational Health Rev. Ottawa 17, (4) 19-22, 1965.

Engine exhaust gases are capable of affecting health in varying degrees, and confusion as to their relative importance often arises. This is partly because most exhaust analyses are reported only as concentrations within the exhaust system, without specifying the total exhaust volume. For clarification, a comparison is made of the actual amounts in which these components are emitted from various engines. These data exemplify the

difference in ventilation requirements for diesel engines and gasoline engines. The toxic effects of carbon monoxide and some basic ventilation considerations are outlined. (Author abstract)#

01306

L. E. Reed and C. R. Barrett

AIR POLLUTION FROM ROAD TRAFFIC - MEASUREMENTS IN ARCHWAY ROAD, LONDON. Intern. J. Air Water Pollution, No. 9: 357-365, 1965.

Measurements of smoke near a busy main road in London showed concentrations (up to micro grams/cubic meter) ten to twenty times greater than those at a site about one hundred yards away from the road. These high concentrations are considered to be due to diesel vehicles. Correspondingly high values for sulphur dioxide and oxides of nitrogen at the roadside site are attributed to road traffic generally. (Author abstract)##

01362

E.K. Diehl E.A. Zawadzki

CONTAMINANTS IN FLUE GASES - AND METHODS FOR REMOVAL. Coal Age, Vol. 70:70-74, Dec. 1965. (Presented at Technical Sales Conference, National Coal Association and Annual Meeting of Bituminous Coal Research, Inc., Sept. 1965.)

The relative importance of the harmful pollutants in stack gases from coal combustion is described. Polynuclear hydrocarbons, ocides of nitrogen, particulates, and sulfur oxides are considered. Sulfur dioxide removal methods are described.##

01375

E.S. Starkman H.K. Newhall

CHARACTERISTICS OF THE EXPANSION OF REACTIVE GAS MIXTURES AS OCCURRING IN INTERNAL COMBUSTION ENGINE CYCLES. California Univ., Berkeley, Dept. of Mechanical Engineering, 1965, 13 p. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Chicago, Ill., May 17-21, 1965, Paper No. 650509.)

The influence of nonequilibrium in the expansion gases of spark ignition engines has been studied theoretically to determine how power output and exhaust gas composition might be affected. Comparing a gas which is frozen in composition during expansion with a composition which continuously is in equilibrium shows the difference in expansion work can be as large as 10%. Maximum influence is in the fuel-air ratio range of chemically correct mixture. It was found that carbon monoxide

and nitric oxide concentrations in the exhaust more nearly reflect the frozen composition than the equilibrium expansion. This is particularly true for the range of mixture ratios - from lean to chemically correct.##

01377

R.G. Mastin

COMBUSTIBLES VERSUS NITROGEN FIXATION IN GAS ENGINE OPERATION AND LUBRICATION. J. Eng. Power, April 1965. p. 175-80. (Presented at the Oil and Gas Power Conference and Exhibit, Dallas, Tex., Apr. 12-16, 1964, of the American Society of Mechanical Engineers, Paper No. 64-OGP-4.)

Nitration is preferable to combustibles in the operation of the gas engine because it affects only the lubricating oil. Combustibles affect, in addition to lubricating oil, engine parts by the deposition of carbon, and cause expensive fuel waste. The data were gathered with the aid of an exhaust gas analyzer and a spectrophotometer. The gas engine should never be operated with combustibles in the exhaust gas. In many instances, the wasted fuel will equal the cost of several oil changes during the year. The naturally aspirated, 4-cycle, gas engine should not be operated with 2 to 3 percent excess oxygen content in the exhaust gases, in order that the peak incidence of NO2 may be avoided. R - O - NO2 was found in varying degrees in used oils from all types of gas engines. Deposits from the crankcase parts of gas engines contained R - O - NO2. Gas engine crankcase oils should not be used too long. The oil soluble R - O - NO2 compounds progress to the insoluble form. This form then appears to be the nucleus for the attraction of all foreign material present which forms the deposit. Fuller's earth filtration does not remove oil soluble R - O - NO2 compounds from the crankcase oil.##

01382

R.W. Hurn, T.C. Davis

GAS CHROMATOGRAPHIC ANALYSIS SHOWS INFLUENCE OF FUEL ON COMPOSITION OF AUTOMOTIVE ENGINE EXHAUST. Proc. Am. Petrol. Inst. 38(3):353-375, 1958. (Presented at the 23rd Midyear Meeting, American Petroleum Institute's Division of Refining, Los Angeles, Calif., May 12, 1958.)

Chemical differences in the exhaust products from different fuels; and the effect of engine speed and load on these differences are reported. Experimental data were obtained with the use of a late model automotive V-8 engine on a dynamometer block. Fuels which were used included pure isooctane, commercial LPG (butane and propane, separately), and seven gasoline stocks from different refining processes. Analytical data obtained by gas chromatography show that exhaust composition varies with engine speed and load according to consistent trends. These trends are

influenced by fuel composition, and the degree of fuel influence depends upon mode of engine operation--some basic fuel characteristics are more heavily reflected in the exhaust than are others. Generally, differences in the composition of exhausts from different fuels are quantitatively small, but they are reproducible. (Author abstract modified)##

01383

R.W. Hurn, T.C. Davis, P.E. Tribble

DO AUTOMOTIVE EMISSIONS INHERIT FUEL CHARACTERISTICS?
Am. Petrol. Ins., Proc 40(3):352-357, 1960. (Presented at the 25th Midyear Meeting, American Petroleum Institute's Division of Refining, Detroit, Mich., May 11, 1960.)

In general, the composition of the hydrocarbon component of exhaust produced during engine deceleration is closely related to the fuel. However, during acceleration and cruise the hydrocarbons emitted may be quite dissimilar to the fuel. In this latter instacne the amount of olefin emitted bears no direct relation to fuel olefin. Moreover, reduced fuel olefin with increased paraffinicity generally results in increased emissions of olefin. In all engine cycles, the aromatic content of the exhausts follows the aromatic content of the fuel. Thus, hydrocarbons which are emitted inherit the fuel's characteristics during only a portion of the average driving cycle. During the remainder of the cycle many of the original fuel characteristics are erased and the emissions become no more than characteristic mutations. (Author abstract modified)##

01384

R.W. Hurn, C.L. Dozois, J.O. Chase, C.F. Ellis, P.E. Ferrin

THE POTPOURRI THAT IS EXHAUST GAS. Proc. Am. Petrol. Inst., 42(3):657-664, 1962. (Presented at the 27th Midyear Meeting, American Petroleum Institute's Division of Refining, San Francisco, Calif., May 17, 1962.)

Information concerning the myriad compositions and hydrocarbon distributions that accompany changes in engine mode and that define the variable character of an exhaust gas stream is given. Data were obtained on exhaust gases produced using an engine dynamometer cycled through steady-state and transient modes to simulate demands on the engine in city traffic. Test procedures were designed to optimize reproducibility of the tests. Moreover, analyses were scheduled in a manner to permit determination of all components on the same or on comparable samples. Carbon hydrocarbons by major types, oxygen, oxides of nitrogen, and hydrocarbon-derived ocygenates were determined. Concentrations that were measured fell within a range of values that had been reported in the literature. However, the analyses are unique in

that they provide information on the simultaneous, concurrent concentrations of materials that constitute the exhaust gas flow and on how these concentrations vary with steady-state and transient engine operation. The data also show the manner in which both absolute and relative distributions of hydrocarbon in the exhausts vary with change in engine mode. (Author abstract modified)##

01484

AUTOMOTIVE AIR POLLUTION (A REPORT TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 88-206, THE CLEAN AIR ACT). Preprint. Dec. 1964.

Photochemical air pollution or smog is a problem of growing national importance and is attributable largely to the operation of the motor vehicle. Manifestations of this type of air pollution are appearing with increasing frequency and severity in metropolitan areas throughout the United States. Biological studies of animals show that the photochemical reaction products of automotive emissions produce adverse health effects. There is substantial evidence that these effects may appear in humans after extended exposure to air which is known to be polluted with these same products in many of the larger urban areas. Laboratory experiments have demonstrated that reductions of atmospheric hydrocarbons, an important emission from motor vehicles, can reduce photochemical air pollution and such manifestations as eye irritation and plant damage. Other automotive emissions such as nitrogen oxides and carbon monoxide have also been determined as significant. Nitrogen oxides, which appear in engine exhaust gases as well as the effluent of other combustion processes, also play an important role in photochemical air pollution. Technical procedures for reducing these emissions are not so clearly established as for hydrocarbons. Carbon monoxide, although not a contributor to atmospheric photochemical reactions, is a directly toxic substance. Technical procedures have been developed which substantially reduce emissions of this pollutant. The current problem and progress in its resolution are reported. (Author summary modified)##

01488

Ludwig, J. H.

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Technology Research and Development Programs, Washington, D.C. ((54))p., 1968. 1 ref.

The contribution of motor vehicle emissions to community-wide air pollution levels; emissions from gasoline and diesel engines; and photochemical reactions in the atmosphere are reviewed.##

01494

A. C. Stern

HOW THE UNITED STATES LOOKS AT THE AUTO EXHAUST PROBLEM. Public Health Service, Washington, D.C., Div. of Air Pollution. (Presented at the Air Pollution Congress of the Swedish National Clean Air Council, Stockholm, Sweden, May 5, 1965.)

Photochemical smog, air quality standards and criteria, pollutant levels, evaporative losses, crankcase emissions, blow-by systems, exhaust emissions, maintenance, fuel modification, afterburners, new-type engines, particulates, and diesel engines were subjected to review.**

01534

H. Wozniczek

AIR POLLUTION BY MOTOR CAR EXHAUST GASES) ZATRUCIE Powietrza Przez Spaling Samochodowe. Ochrona Pracy (Warsaw), 21(5):14-17, May 1966.

Pollution of towns and cities by automotive emissions is described. Chemical analyses of the various constituents of exhaust gases are given. Toxicity of these constituents is discussed.**

01565

E. S. Starkman

ENGINE GENERATED AIR POLLUTION - A STUDY OF SOURCE AND SEVERITY. Preprint. (Presented at the Federal International Societes Ingeneures Techniques De L'Automobile, Germany, June 15, 1966.)

A brief comprehensive view of the state of knowledge, legislation, research and application of devices to control the influence of reciprocating engine emissions on man and his environment is presented from the viewpoint and experiences of a California observer. The pollutants considered are: unburned hydrocarbons; carbon monoxide; oxides of nitrogen; carcinogens; particulate matter; lead; odor; and oxides of sulfur. Engine operating modes and severity of emissions; engine factors and emissions; and legislative control of emissions are considered.**

01568

THE OXIDES OF NITROGEN AND THEIR FORMATION (CHAPTER I OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept.

of Public Health, Berkeley, Bureau of Air Sanitation. Jan. 1966. 1-6 pp.

Chapter briefly describes the chemical and physical properties of the oxides of nitrogen. Mention is made of the role the nitrogen oxides play in automotive air pollution (this facet is more deeply covered in subsequent chapters). Three graphs are presented: (1) effect of spark timing on oxides of nitrogen concentration; (2) effect of compression ratio on oxides of nitrogen concentration; (3) effect of manifold air pressure on oxides of nitrogen concentration.##

01572

OXIDES OF NITROGEN IN THE ATMOSPHERE (CHAPTER V OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation, p. 33-51. Jan. 1966.

This article discusses the air monitoring systems in California which detect the concentrations of nitrogen oxides. Concentrations are given for hourly, daily, monthly and seasonal variations. Statistics are also stated for hydrocarbon emissions but not in as much detail as for the oxides of nitrogen.##

01573

COLOR EFFECTS OF NITROGEN DIOXIDE IN THE ATMOSPHERE (CHAPTER VI OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 53-63, Jan. 1966.

The coloration effect of NO2 in the atmosphere depends on NO2 concentration, viewing distance, and aerosol concentration. The effect of 0.5 ppm NO2, with a viewing distance of 10 miles, is postulated to be acceptable on days of 10 mile visibility. In an aerosol-free atmosphere, with the same viewing distance of 10 miles, the acceptable NO2 concentration is about 0.1 ppm. In reality, an aerosol-free atmosphere does not occur in metropolitan areas, and a visibility of 20 miles would represent a reasonable goal for atmospheric clarity. On such days, the acceptable NO2 concentration would be about 0.25 ppm. (Author summary)##

01574

PHYTOTOXICITY OF NITROGEN DIOXIDE (CHAPTER VII OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 65-67. Jan. 1966.

A brief resume of the effects nitrogen dioxide has on plant species is presented. The conclusion is that concentrations in excess of 2-2.5 ppm are necessary to cause appreciable plant damage.##

01575

PHOTOCHEMICAL EFFECTS OF NITROGEN OXIDES (CHAPER VIII OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 69-89, Jan. 1966.

The chemistry of the photochemical reaction is reviewed, with emphasis on the role of nitrogen oxides. It is concluded that quantitative predictions cannot be made about the changes in the photochemical smog effects that would result from various degrees of control of either hydrocarbons or nitrogen oxides from motor vehicles.##

01576

BIOLOGIC EFFECTS OF NITROGEN DIOXIDE (CHAPTER IX OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 91-112 Jan. 1966.

Article reviews the toxic effects that nitrogen dioxide has on man and animal. A chart specifying the concentration (ppm) of nitrogen dioxide, the effects on man and lower animals, and a reference for this data is presented. The concentration range is 0.05 ppm to 500 ppm.##

01583

R.W. Gerstle R.P. Peterson

ATMOSPHERIC EMISSIONS FROM NITRIC ACID MANUFACTURING PROCESSES - A COMPREHENSIVE SUMMARY. Preprint. (For Presentation at the American Inst. of Chemical Engineers, Detroit, Mich., Dec. 8, 1966.)

Atmospheric emissions from nitric acid plants depend on plant operating conditions, production rates, and the use of control devices. Data in this article show that plants operating within design capacities and producing 55-60% nitric acid can limit the nitrogen oxides concentration to 0.3% in the stream leaving the absorption tower. This is equivalent to about 50 pounds of nitrogen oxides per ton of nitric acid (100% basis) produced. Installation of scrubbers or catalytic reduction equipment

can reduce these emissions by 50 to 97%. Emissions during startup or shutdown usually do not create any special problems. (Author summary modified)##

01624

D. A. Jensen

SOURCES AND KINDS OF CONTAMINANTS FROM MOTOR VEHICLES (INFORMATIVE REPT. NO. 4). J. Air Pollution Control Assoc. 14, (8) 327-8, Aug. 1964. (TA-10 Vehicular Exhaust Committee).

The sources of the pollutants, the important compounds, and the magnitude of the several contaminant sources from both gasoline and diesel powered motor vehicles are indicated.##

01740

K. Grosskopf

THE PROBLEM OF PROVIDING ADEQUATE VENTILATION AT THE POINT OF WORK DURING GAS AND ARC WELDING. Zum Problem der Ausreichenden Beluftung des Arbeitsplatzes bein Gas- und Lichtbogenschweissen. Schweissen Schneiden (Duesseldorf) 18, (7) 323-5, July 1966.

Safety regulations governing welding require that adequate ventilation should be provided at the point of work. This rather unprecise formula can be clarified by localizing one of the gases cahracteristic to the welding process concerned, taking into account in each case the permissible MAK value. In the case of gas welding and open arc welding with coated electrodes the gas recommended is a nitrous gas, for plasma welding and TIG and MIG welding it is ozone. If CO2 is used for welding then special attention must be paid to the carbon monoxide content in the room atmosphere. The controls can be carried out in a simple manner through the use of suitable detector tubes. (Author summary)##

01842

D. F. Walters and D. O. Martin

AN EVALUATION OF THE AIR POLLUTION ASPECTS OF THE PROPOSED STEAM-ELECTRIC PLANT AT OAK PARK, MINNESOTA. Preprint. 1965.

The installation and operation of the 550,000 kilowatt steam-electric plant at Oak Park, Minnesota, will generate large quantities of air pollutants, principally sulfur dioxide,

nitrogen oxides, and particulate matter. A 785-foot stack will be installed to permit dispersion and dilution of gaseous pollutants. Calculations indicate that ground level concentration of sulfur dioxide may cause acute damage to vegetation. However, existing information is inadequate to predict with assurance whether long-term chronic effects will be experienced by long-lived vegetation such as trees. It is expected that the human perception threshold for SO2 will be exceeded occasionally. Inversion breakup fumigation may produce ground level concentrations exceeding the human perception threshold at distances of ten miles or more. The installation and operation of a second unit of 750,000 kilowatt capacity will more than double air pollution emissions. If the 550,000 kilowatt unit is built and operated, a SO2 monitoring network should be activated. This will assist in determining the effects of SO2 on the surrounding vegetation and people, as well as provide guides for future installation design. Prevailing winds in this area are such that air pollutants will often be carried into Wisconsin. Therefore, officials of that State should take part in air pollution activities connected with the proposed plant. Plans and studies should be started now to obviate future air pollution problems indicated by plans for expansion of this plant beyond the initial 550,000 kilowatt capacity.##

01848

A. H. Rose

SUMMARY REPORT OF VEHICULAR EMISSIONS AND THEIR CONTROL. Preprint. (Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, Chicago, Ill., Nov. 1965.)

The report summarizes average emissions from the four sources of contaminants in the present day automobile: the exhaust, the crankcase, the fuel tank, and the carburetor. Levels of contaminants presented are for emissions under average urban driving conditions, in contrast to earlier work in which values were based on cyclic dynamometer tests. Emission levels are expressed as pounds per day emitted and, where applicable, as concentration. Emissions are considered by general chemical classes to indicate the relative photochemical reactivities of compounds from each of the four sources. Control approaches are briefly discussed. (Author abstract)##

01863

AUTOMOTIVE AIR POLLUTION; (SECOND REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206 - THE CLEAN AIR ACT.) 89th Congress (1st Session (Document 42) July 15, 1965. 17 pp.

This report is devoted to the development of an air use plan for the St. Louis metropolitan area. An air use plan may be thought of as a link between the potential pollutant emissions of a community and the air quality goals. Its function is to optimize the use of the air with respect to the amount of pollutants emitted, by considering the dilution capacity of the air basin and the configuration of the pollutant sources in the area. The air use plan may then be used as the basic framework for achieving the desired air quality by the various means available such as limiting the emissions from individual sources, limiting the emissions from sources in certain areas, or even disallowing new pollution sources in overburdened areas. In short, it provides the basis for enacting control regulations and provides a guide for future planning activities.##

01902

M. Mukai, J. F. Thomas, and B. D. Tebbens.

AROMATIC HYDROCARBONS PRODUCED DURING COMBUSTION OF SIMPLE ALIPHATIC FUELS. Anal. Chem. 37, 398-403, Mar. 1965. (Presented before the Division of Water, Air and Waste Chemistry, 148th Meeting, American Chemical Society, Chicago, Ill., Sept. 1965.)

The combustion of simple aliphatic fuels such as methane and propane at atmospheric pressure results in the formation of a wide array of products. Previous work has been concerned with arene-type products. Current work has shown the relative production of benzene, toluene, ethybenzene, as well as other simple alkyl substituted derivatives of benzene. The practical aspects include an index of relative abundance of the latter type of compounds that might be found in polluted atmospheres as well as indicating a method for predicting the relative contribution of automobile exhaust to atmospheric pollution. (Author abstract)##

01958

P. W. Leach, L. J. Leng, T. A. Bellar, J. E. Sigsby, Jr., and A. P. Altshuller

EFFECTS OF HC/NOX RATIOS ON IRRADIATED AUTO EXHAUST, PART II. J. Air Pollution Control Assoc. 14, (5) 176-83, May 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 11-13, 1963.)

The relative concentrations of individual hydrocarbons have been shown to be independent of autoexhaust concentration in dynamic irradiation experiments. The absolute concentrations of the individual hydrocarbons are linearly related to total hydrocarbon concentration. The decrease in the concentration of reactive hydrocarbons during irradiation is found to be independent of whether a 120- or a 180-minute average irradiation time is used. A fourfold reduction in initial hydrocarbon concentration at constant hydrocarbon to nitrogen oxide level causes a slight

increase in the relative amounts (percent) of hydrocarbon consumed during irradiation. The same fourfold reduction in initial hydrocarbon concentration at constant nitric oxide level results in a decrease in the percent of olefins reacted, but does not affect the percent of aromatics reacted. If the hydrocarbon level is kept constant, while the nitrogen oxide level is varied, an increase in nitrogen oxides causes a marked reduction in the percent of olefinic and aromatic hydrocarbons reacted during irradiation. The aldehyde yields are linearly related to the total hydrocarbon level. No significant effect on aldehyde yields was found when the average irradiation time was varied from 120 to 180 minutes. The aldehyde yields did vary with a decrease in yield both at very high and very low ratios of hydrocarbon to nitrogen oxide. The individual hydrocarbon and aldehyde concentrations are shown to fall well within the range of atmospheric concentrations. Although the aldehydes may be responsible in part for the eye irritation, the presence of other eye-irritating species must be postulated to explain the shape of the eye-irritation response curves when plotted against nitrogen oxide concentration.##

02066

W. Breuer, and K. Winkler.

SOURCES AND DISTRIBUTION OF AIR POLLUTIONS ASCERTAINED BY STATIONARY RECORDING OF GASEOUS COMPONENTS. Herkunft Und Ausbreitung Von Luftverunreinigungen, Ermittelt Durch Stationare Registrierung Mehrerer Immissionskomponenten. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VII/10). pp. 239-42.

Simultaneous, continuous and stationary measurement of the concentration of gas components (CO, CO2, SO2, H2S, C12, nitrous gases, hydrocarbons) combined with the recording of meteorological factors (wind direction, speed of wind, atmospheric stability etc.) enable the identifying of the source of air pollutions (motor vehicle exhaust, domestic heating, power stations, chemical works). The examination of special air conditions and statistical evaluation gives information on the process of distribution. (Author abstract)##

02244

A.H. Rose, Jr., R.C. Stahman, H.V. Korth

DYNAMIC IRRADIATION CHAMBER TESTS OF AUTOMOTIVE EXHAUST, PART I. J. Air Pollution Control Assoc. 12, 468-73, Oct. 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

The data from this series of tests run under dynamic irradiation conditions show differences attributable to: (1) the concentration of exhaust gas at which the irradiation was made, and (2) the composition of the fuel used to produce the exhaust gas. Evaluations of the variations in chemical reaction and

biological effects show: (1) The rate of NO2 formation increased proportionately with both exhaust concentration and olefin content of the fuel. (2) The percentage of NO2 reacting with unreacted fresh exhaust components and with secondary reaction products varied inversely with the increase of the exhaust concentration level. (3) No consistent change in oxidant concentration level (primarily ozone) resulted from an inarease in the hydrocarbon concentration level at which the irradiation was made. (4) Formaldehyde formation increased in direct proportion to the increase in hydrocarbon concentration at irradiation. (5) Plant effects indicate a shift in the type of phytotoxicant developed and a decrease in damage level with increase in the hydrocarbon concentration level at which the irradiation was made. (6) Bacterial effect showed a significant increase in degree of kill with increase in hydrocarbon concentration level at which the irradiation was made. (Author summary)##

02148

T. Taga

(NO2 GAS GENERATED IN THE COMBUSTION CHAMBER OF COAL BURNING BOILERS.) Clean Air Heat Management (Tokyo) 15 (4), 5-9 (Apr. 1966). Jap. (Translated as JPRS-R-8588-D.)

The author emphasizes the importance of NO2 in air pollution and urges that as much effort should be exerted in abating pollution due to this gas as to SO2 or SO3 which are currently under extensive study. The paper describes the experimental study done by the U.S. Bureau of Mines, and discusses the results of a similar study by the author.##

02312

AIR RESOURCES OF UTAH. Utah Legislative Council, Salt Lake City, Air Pollution Advisory Committee. June 1962. 32 pp.

A survey was made of the available information concerning air pollution problems in Utah. No evidence was found to indicate that Utah has a major air pollution problem at this time; however, a few perisistent problems exist in restricted areas. Over the years three air pollution situations in Utah have produced injury to plant and animal life or have constituted a public nuisance. These are: (a) sulfur dioxide in Salt Lake Valley (non-ferrous smelters, burning of coal, gasoline combustion, and petroleum refining are the principal sources); (b) smoke and smog along the Wasatch Front and in other localized areas (burning of coal, open burning on municipal dump grounds and in junk yards, and waste disposal around private homes constitute the major sources); and (c) fluorides (processing of Utah ores by steel mills in Utah County, brick and ceramic plants, phosphate fertilizer plants, and general combustion processes are the

principal sources. Industry has made substantial progress in alleviating sulfur dioxide, fluorides, smoke, and hydrocarbons by installing expensive control equipment and by supplementing this equipment with extensive research, survey, and monitoring programs. Legislation authorizing the state, or cities and towns, to deal with public nuisances if ound in the Utah Code. There is no definition of air pollution, however, and its treatment as a nuisance is questionalbe. Enabling legislation should define the problem, permit study of its effects, and permit actions to control injurious practices. (Author summary modified)**

02335

H. K. Newhall.

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF CHEMICAL KINETICS DURING RAPID EXPANSIONS OF HIGH TEMPERATURE COMBUSTION PRODUCTS (DOCTOR'S THESIS). (For the degree of Doctor of Philosophy in Engineering, California Univ., Berkeley. Graduate Div.) Sept. 1966. 198 pp.

Theoretical analysis predicts that during expansion of combustion products occurring in internal combustion engines, the rate of atom and free radical recombination is sufficient for equilibration of these species. It is further predicted that as a result of kinetic limitations, nitric oxide persists in hyper-equilibrium concentrations. Theoretical analysis of the kinetics of the expansion process was performed through use of a digital computer. Overall reactions considered were the decomposition of nitric oxide and the recombination of atomic oxygen, atomic hydrogen and the hydroxyl free radical. Rate expressions for the overall reactions were formulated through consideration of all significant elementary reactions. Reaction rate data for the elementary reactions were obtained from a large number of published sources. Nitric oxide is of considerable importance in the problem of automotive air pollution and an experimental study of nitric oxide decomposition occurring during engine cycle expansion was undertaken. A single cylinder research engine was equipped with an infrared transmitting window. The emergent infrared radiation was studied by means of spectroscopic equipment making possible the determination of nitric oxide concentrations throughout expansion. The results indicate that nitric oxide concentration remains fixed throughout the entire expansion process. (Author summary modified)**

02362

J. H. Ludwig

STATUS OF VEHICLE EMISSIONS IN AIR POLLUTION. Preprint. (Presented at the Eighth Annual Environmental Health Inst., Colorado Association of Sanitarians, Denver, Apr. 26, 1963.)

Review of the various classes of motor vehicles in use today and associated power plants indicates that as a group the

gasoline-powered passenger car accounts for the major share of auto exhaust emissions associated with production of photochemical smog. Of the various sources of emissions from all types of vehicles, tailpipe emissions from gasoline-powered vehicles are the most significant, followed by crankcase

02375

J. E. Sigsby, Jr. and M. W. Korth.

COMPOSITION OF BLOWBY EMISSIONS. Preprint. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 21-25, 1964, Paper No. 64-72.)

The composition of blowby emissions was evaluated from ten different cars with displacements ranging from 52 cu in. to 365 chromatographic analyses were made of the blowby hydrocarbon composition covering a group of approximately 75 components. Nondispersive infrared and flame ionization equipment were also used to determine CO, CO2 and hydrocarbon concentrations. (Author abstract)##

02610

C. V. Kanter, and R. G. Lunche

EMISSIONS AND POLLUTANT LEVELS (TRENDS IN LOS ANGELES). Arch. Environ. Health 8, (1) 5-14, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

For accurate assessment of the problems, needs, and progress of an air pollution control program, accurate information must be obtained on emissions of contaminants from sources, and on contaminant levels. This is a very large task, requireing the acquisition of a great mass of data on a continuing basis. In a large community suffering the blight of smog, the acquisition of data is imperative in order to take effective action to stop the advancing menace and to begin a trend back toward clean air. In Los Angeles total air pollution surveys and air monitoring activities have provided the means for understanding the basic causes of the smog problem, and for guiding actions which have slowed the advance of smog and which will turn it back. Inspection of trends of emissions and contaminant levels in Los Angeles County affirms that a vigorous control program on stationary sources can slow and even reverse trends. It is clear though, that permanence of these effects cannot be achieved until the increasing emissions from motor vehicles are controlled. Of the major contaminants discussed, only sulfur dioxide, which is not significantly affected by motor vehicles emissions, has regressed.

02635

J. H. Boddy and D. Turner

A DEFINITION OF THE PROBLEM AND SIGNIFICANCE OF AIR POLLUTION FROM PETROL-ENGINED VEHICLES (PART I OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 1-34.

World-wide legislation is reviewed; the existing and probable restriction on vehicle use and design is presented. The motor vehicle pollutants are detailed. The public health significance is examined. Automotive emissions are compared to those from other sources. Existing legislation in the western and non-Communist world, other than the Californian legislation, imposes negligible restrictions on the gasoline engine at present, but shows indications of imminent action. Legislation in many countries is framed in such a way that regulations against emission from gasoline vehicles could be enforced without major revision of legislation. This is most apparent in recent revisions of legislation, e.g. Ireland, France, and Belgium. When and if the present legislation in the U.K. is successful in controlling pollution from industrial and domestic sources, more attention must inevitably focus on the motor vehicle. The gasoline-engined vehicle makes a major contribution to the following pollutants: carbon monoxide, unburnt hydrocarbons, and oxides of nitrogen. Of these pollutants referred to, carbon monoxide is certainly the most undesirable. Oxides of nitrogen may be more damaging in respect to chronic exposure but evidence is limited. Unburnt hydrocarbons in vapour form appear significant only in relation to photochemical smogs. Heavy hydrocarbons in association with non-particulate matter, like oxides of nitrogen, have possible significance in relation to effects of chronic exposure. The use of lead in gasolines appears to have minor significance as a health hazard in respect to its pollution of the atmosphere. Major attention should be immediately devoted to the reduction of carbon monoxide emission from automotive vehicles. In the interests of clarifying the situation and, as a safeguard against possible legislation of an unnecessarily restrictive nature, the motor and petroleum industries should support research into the significance of such emissions as oxides of nitrogen and heavy hydrocarbons and methods of reducing these.##

03113

R.W. Gerstle, S.T. Cuffe, A.A. Orning, C.H. Schwartz

AIR POLLUTANT EMISSIONS FROM COAL-FIRED POWER PLANTS, REPORT NO. 2. J. Air Pollution Control Assoc. 15, (2) 59-64, Feb. 19659

The Public Health Service and the Bureau of Mines are conducting a joint study to evaluate a number of flue-gas-stream

components from coal-burning power plants. Emissions of fly ash, sulfur oxides, nitrogen oxides, polynuclear hydrocarbons, total gaseous hydrocarbons, formaldehydes, certain metals, and carbon dioxide are determined. A previous paper covered air pollutant emissions from vertical-fired and front-wall-fired power plant boilers. This paper includes a comparative evaluation of emissions from a tangential-fired and a turbo-fired power plant boiler. (Author abstract)##

03164

M. E. LePera

INVESTIGATION OF THE AUTOXIDATION OF PETROLEUM FUELS (INTERIM REPT.). Army Coating and Chemical Lab., Aberdeen Proving Ground, Md. (CCL Rept. 204) (Project 1C024401A106). JUNE 1966. 24 PP.
CFSTI,DDC AD 641270

The deterioration of petroleum fuels was studied by investigation of their autoxidation susceptibilities. Federal and Military Specification fuels and commercial gasolines were subjected to a six-week accelerated aging test with analyses for generated hydroperoxides determined at weekly intervals. The resulting peroxide-time curves revealed autoxidation tendencies to vary considerably. Under the conditions of this aging technique, there is evidence that the bulk storage supply of combat gasoline (MIL-G-3056B) at Aberdeen Proving Ground is experiencing a gradual depletion of antioxidant quality. (Author abstract)##

03198

AUTOMOTIVE AIR POLLUTION (FIFTH REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 88-206 AS AMENDED BY PUBLIC LAW 89-272). 90th Congress (1st Session) (Document No. 8) Dec. 1966. 14 PP.
GPO 74-5880

The procedure is described whereby the manufacturer may apply for a certificate of conformity and it describes the activities of the certification laboratory established by the Department to verify the manufacturer's test data. The status of legislation at the State level to provide for continued compliance following Federal certification is also covered. The effectiveness of the Federal control program, as it may be anticipated from early experiences under California's similar program, is discussed in a section on surveillance testing. The Federal standards, which were established March 31, 1966, are subject to revision as new dimensions of the problem are defined and as limitations become apparent in the implementation of existing standards. Current

standards of emissions control apply to two contaminants, hydrocarbons and carbon monoxide, and to two possible emission sources, crankcase and exhaust systems. It is probable that nitrogen oxide, lead, sulfur dioxide, odor, and particulate components of motor vehicle exhaust will become the subject of future standards; the fuel system and evaporation losses associated with it is the subject of study for early inclusion among systems requiring control. Research studies upon which revised standards and procedures will be based are reviewed. The policy which will prevail in the establishment of new emission standards on a national level is one which will recognize the needs of the most susceptible members of the population at risk and the quality of the air where the risk is highest. Sections of this report deal with the air quality as it refelcts the extent of the automotive air pollution problem in many cities across the United States and its potential influence on the health and well-being of their citizens. (Author summary modified)##

03202

V. Del Vecchio.

THE PROBLEMS OF BASIC URBAN AIR POLLUTION. Il problema dell'inquinamento di fondo urbano dell'aria atmosferica. Fumi Polveri (Milan) 6, (6) 177-8, June 1966.

Basic urban air pollution refers to the discharge into the air of exhaust gases from motor vehicles and from heating units, which are prevalently inefficient. Both sources discharge respirable dusts and gases, the latter including some aliphatic and aromatic hydrocarbons which have proven carcinogenic in experimental animals. The problem arising from the incomplete combustion of motor fuels is aggravated by the presence, in Italian cities, of narrow streets and relatively high buildings which become repositories of emitted fumes and dust from slow-moving vehicles. As much as 12 to 13% CO may be present in gasoline-driven motor car exhaust. While gross measurement of pollutants present in the urban air is of high indicative value, public health aspects of the problem demand that granulometric studies of the dust particles also be conducted, since size is a factor in respirability. In addition, photochemical studies involving the interaction between the pollutants in the air and the sun's rays indicate that solar radiation transforms the originally present contaminants into biologically more receptive compounds, quite different from their precursors. Thus peroxacetylnitrate(PAN) is produced from NOx, and the new substance is a powerful irritant of the mucus membranes. The dramatic episodes of mass illness resulting from smog in various places in recent years were caused by the phenomenon of thermal inversion which prevented the dispersion of the irritants present in the air.##

03233

W. Thurauf and W. Ehnert

((THE FORMATION OF NITRIC OXIDE DURING COKING.)) Uber die

Bildung von Stickstoffmonoxid bei der Verkokung und seine Bestimmung in Koksofengas. Brennstoff-Chem. (Essen) 9(48):270-273, Sept. Translated from German as JPRS R-8582-D.

Experiments were undertaken in order to settle the question of where and when nitric oxide is formed during the coking process, and the manner in which the nitric oxide content of coke oven gas changes during the process of coking. The experiments were conducted on a small scale, employing specially designed apparatus with the thermal energy being provided by an electric heater, in order to eliminate the possibility that coking fuels are responsible for the formation of nitric oxide. It was found that nitric oxide begins to form during the first state at which gas is driven off; and that the extent to which it continues as the temperature is raised depends on the type of coal, its granular structure, and the temperature rise. Formation appears to be complete by the time that the coking coal reaches a temperature of 400 C. In the case of ground coals, the finer the grains the lower the formation of nitric oxide, and vice versa; the reverse being true for coal dust obtained by sifting coal that had been stored in the open air. The NO contents of subsequently heated alcohol extracts from coals are approximately the same as those of the same coals directly heated in a helium atmosphere, and are from four to twelve times as great as the volumes contained in the distillation gases obtained during the coking process. This indicated that approximately 90% of the NO which is formed during coking is subsequently decomposed by reactions with the other distillation products. NO is not formed, as formerly believed, through oxidation during coking, but rather from the decomposition of substances which are formed when coal is stored in the open air.##

03255

R. L. Cummins and V. J. Konopinski

MOTOR VEHICLE EXHAUST CONCENTRATIONS IN A ROAD TUNNEL. Preprint. (Presented at the Conference of the American Industrial Hygiene Association, Philadelphia, Pa., Apr. 29, 1964.)

The contribution of motor vehicle exhaust to ambient air pollution was studied by using a vehicular-road tunnel as a sampling site. An intensive aerometric study was conducted April 20 through 28, 1963, at the Sumner Tunnel in Boston, Massachusetts. The tunnel is now operated as a one-way tube. Air quality was determined on the fresh air supplied to the tunnel (inlet air), on the air exhaust from the tunnel (exhaust air), and at three sites within the tunnel. Particulate pollutants were analyzed for total suspended particulates, benzene-soluble organics, sulfates, nitrates, metals, and polycyclic hydrocarbons. Concentration of SO2, oxides N, NO2, aliphatic aldehydes, and CO were also determined. The average concentration of total suspended particulates in the inlet air was 86 micrograms/cu m while that of the exhaust air was 424 micrograms/cu m. The concentrations of

total particulates, benzene-soluble organics, sulfates, and nitrates for the inlet and exhaust air were less than reported in a previous study. The ranges of concentrations of oxides N, NO2, and aliphatic aldehydes in the tunnel were, respectively, 11.3 to 43.0, 3.5 to 8.8, and 3.1 to 12.6 parts per hundred million (hereafter referred to as pphm). SO2 concentrations ranged from 0.1 to 0.5 pphm, and were less than ambient concentrations. The mean daily concentration of CO was 2.3 ppm in the inlet air and 50.8 ppm in the exhaust air. Mean concentrations in the tunnel ranged from 20.5 to 54.2 ppm and increased with increasing distance into the tunnel. Other pollutants exhibited a similar gradient. The particulate pollutant concentrations measured during April 1963 study are less than those measured in 1961. This decrease may be attributable to operation of the tunnel with one-way traffic and the concomitant piston effect, and to a 36 percent decrease in the average number of motor vehicles using the tunnel. Values for polycyclic hydrocarbons reported for the 1961 study were in error; corrected values are given in this report. (Author abstract) ##

03265

A. P. Bush, R. A. Glater, G. Richards, and J. Dyer

EFFECT OF ENGINE EXHAUST ON THE ATMOSPHERE WHEN AUTOMOBILES ARE EQUIPPED WITH AFTERBURNERS. Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963.)

"Typical" smog damage of the conventional type if induced in Nicotiana glutinosa when the ratio of pure air to automobile exhaust is in the range of 1000 to 1 in the test facility. A specific cycle of engine operation involving acceleration, cruise, deceleration and idle produced typical damage. The absence of cruise in the cycle caused no damage to occur. With an after burner on the exhaust of internal combustion engines, it becomes apparent that a new type of injury was being induced in Nicotiana glutinosa plants. Fumigations with afterburner exhausts consistently produced atypical plant damage, whereas automobile exhaust fumigations, without afterburner devices, usually produced typical oxidant damage. 2t is considered that since the concentration of hydrocarbons is reduced using the afterburner, one of the principal air polluting agents has been eliminated; typical air pollution therefore, does not occur. This does not mean that plant damage is eliminated, only that the usual type of plant damage appears to have replaced it (atypical). Some of the exceptions to the trends described in #1 above can be explained on the basis of lack of sweep of the tunnel so that residual smog-forming materials may have remained behind. The tunnel must therefore be carefully swept with air passed through beds of activated charcoal for at least 15 hours before the fumigation can have validity. Plant damage does not correlate well with measured concentrations of nitric oxide. Atypical damage is produced however in almost every instance of afterburner exhaust fumigation. Since the fumigation period includes the period when the oxides of nitrogen are high (ppm or so) it may be speculated that the new damage is due to oxides of

nitrogen in the absence of high hydrocarbon. There is fair correlation between hydrocarbon concentrations and the appearance of typical damage when no afterburner is used. Afterburner exhaust in the chamber showed no appreciable human eye irritation resulting from the new atmosphere while automobile exhaust without afterburner produced eye irritation of the type described by Buchberg. (Author conclusions)##

03355

R. Sutton and E. S. Starkman

OXIDES OF NITROGEN IN ENGINE EXHAUST WITH AMMONIA FUEL. California Univ., Berkeley, Dept. of Mechanical Engineering. (Technical Rept. No. 7 and Rept. No. TS-66-4.) June 1966. 28 pp.
CFSTI, DDC 640444

At maximum output, more oxides of nitrogen are produced by combustion of ammonia than with hydrocarbon fuels. This is partly a result of peak power occurring at low mixtures with ammonia. Disproportionate quantities of nitrogen oxides which are encountered with ammonia at lean mixture ratios indicate a probable result of the direct production of NO in the ammonia pyrolysis scheme.##

03424

G.V. Sheleikhovskii

SMOKE POLLUTION OF TOWNS. Academy of Municipal Economy, Russia. (Translated by the Israel Program for Scientific Translations.) 1949. 206 pp.
CFSTI: OTS 60-51074

This book contains the theoretical basis for a quantitative treatment of the pollution of air by industrial and domestic smoke, and provides numerous formulas for the calculation of air pollution and its influence on the microclimate of populated areas. The author also discusses the protection of urban vegetation from polluted air and its corrosive action on building materials. He indicates practical ways of purifying the atmosphere of thickly-populated areas. The fundamental propositions of the author's theory were tested experimentally on a model; they accord with the results of actual observations. This work is intended as a handbook for engineers and sanitary inspectors concerned with solving the practical problems associated with city planning, particularly the relative location of residential and industrial areas. (Author abstract)##

03438

B. C. Blakeney and M. D. High.

CLEANER AIR FOR NORTH CAROLINA (A SURVEY AND APPRAISAL FOR AIR POLLUTION PROBLEMS). North Carolina State Board of Health, Raleigh, Div. of Sanitary Engineering and Public Health Service, Washington, D.C. Div of Air Pollution. Sept. 1959. 62 pp.

The most frequently occurring air pollution problems attributed to industrial and municipal establishments results from emissions of smoke, soot, or fly ash from fuel burning equipment. The lumber, wood and furniture industries are frequently sources of dust. Asphalt paving material plants create more acute air pollution problems than any other industry. Pulp and paper mills are the cause of odor complaints and are considered the cause of some property damage. A variety of waste disposal operations emit excessive smoke and odors. In eight cities, open dumps have caused complaints and in five cities semi-landfills (burning before covering) have resulted in public request for relief. Control of gases, dusts, and other pollutants cannot be legally required by the State except through the Nuisance Code or indirectly through some other statue. The lack of specific State legislation limits the control of air pollution to the jurisdictional area of a few cities, whereas pollution of community air is not confined to man-made boundaries or jurisdiction. Existing and potential air pollution problems requiring further investigation are discussed.##

04212

S. Abe

THE PRESENT STATUS OF AIR POLLUTION. Clean Air Heat Management (Tokyo) 15, (7-8) 7-18, Aug. 1966. Jap.

The present status of air pollution in Japan is given naming the kinds of contaminants and their origin, factors affecting contamination density, and various types of smog. The types of contaminants are: 1) minute particles (less than 1 micron in size) such as found in soot, carbon, ashes, dust; 2) coarse particles (greater than 1 micron in size), as found in dust, ashes, and minerals; 3) reactive substances found in mist, fog, and vapor such as SO2, SO3, H2S, CO2, CO, NO2, N2O3, O3, aldehydes, HCl, NH3, HF, Pb, Hg, Cd, As, Be and 3, 4-benzpyrene. The contaminants originate from factories, chemical plants, power stations, domestic heating, public baths, hotels, laundries, dry cleaning establishments, hospitals, schools, and public buildings. Also discussed are the human factors affecting air pollution such as public awareness and interest, seasonal, weekly, and daily changes in heating and cooking. Meteorological aspects are covered such as wind direction and velocity, turbulence, temperature, rain and snow. The types of smog found in New

York, London, Los Angeles, Pittsburgh, and Yokkaichi are described. Graphs and tables list symptoms and diseases affecting plants and humans and give the density of dust particles and SO2 in the main cities of Japan. Data on the sulfur content of various oils produced by Japanese refineries and on the number of Japanese automobiles produced is included for information on emission sources of pollutants.##

03584

G. R. Cann, W. M. Noble, and G. P. Larson

DETECTION OF SMOG FORMING HYDROCARBONS IN AUTOMOBILE EXHAUST GASES USING PLANTS AS INDICATORS. Air Repair 4, (2) 83-6, Aug. 1954.

Following the identification of hydrocarbons in the 4, 5 and 6 carbon atom range in automobile exhaust gases, it became necessary to determine whether these hydrocarbons, mixed with other exhaust gases, could produce typical smog effects. A study was carried out in which the atmospheric reaction of hydrocarbons was duplicated in the Air Pollution Control District's plexiglas house. Certain plants, which had already been proved susceptible to smog damage, were used as indicators. Gasoline vapor was used as the standard against which the plant damaging effects of automobile exhaust gases were compared. Results show that automobile exhaust hydrocarbons are capable of producing effects equivalent to those resulting from smog. (Author abstract)##

03759

W. Linville and Y. S. Lee

A PRELIMINARY REPORT ON GASOLINE EVAPORATION LOSSES. Los Angeles County Air Pollution Control District, Calif. Jan. 1959. 50 pp.

The objective was to determine (1) the rates of evaporation loss per hour from motor vehicles and (2) the total evaporation losses occurring on smoggy days. The findings of an S.A.E. article, "Carburetor Evaporation Losses," by J. T. Wentworth, General Motors Corporation were applied to the conditions surrounding the Los Angeles basin for the determination of carburetor losses. The evaporation losses from gasoline tanks were determined experimentally by using both freeze-out and weighing techniques. The maximum total evaporation losses from carburetor, hot soak and fuel tank on any single day during the year of 1956 was approximately 213 tons. The maximum total evaporation rate loss from carburetor, hot soak and fuel tank at 100 F ambient temperature was approximately 50 tons per hour. The percentage contribution from carburetor, hot soak and fuel tank is as follows: (A) Carburetor evaporation losses amount to approximately 65 percent of the total (total of 50 tons per hour at

100 F); (B) Hot soak evaporation losses amount to approximately 12 percent of the total (total of 50 tons per hour at 100 F); and (C) Fuel tank evaporation losses amount to approximately 23 percent of the total (total of 50 tons per hour at 100 F). Of the evaporation losses occurring from the carburetor, approximately 20 percent was olefinic. Of the evaporation losses occurring from the fuel tank, approximately 18 percent was olefinic.##

03760

P. P. Mader, H. G. Wayne, J. A. Orcutt, L. A. Chambers, and W. M. Noble.

EFFECTS OF FUEL OLEFIN CONTENT ON COMPOSITION AND SMOG FORMING CAPABILITIES OF ENGINE EXHAUST (INTERIM REPT. NO. 1). Los Angeles County Air Pollution Control District, Calif. Sept. 10, 1958. 100 pp.

In the dynamometer studies the greatest emphasis was put upon the eye irritation-fuel relationship. The levels of hydrocarbon concentrations studied ranged from 0.75 to 35 ppm. All 4 cycles of engine operation plus a composite sample blended according to the relative total volumetric contribution of individual cycles were evaluated. Total aldehydes and formaldehyde were studied using 3 fuels, 3 to 5 engine conditions, and 3 to 9 levels of hydrocarbon concentration. A total of 85 samples were irradiated and analyzed for both total aldehydes and formaldehyde. Ozone determinations were made with 2 fuels at 4 engine operating conditions, and also using the composite mixture. Thirty-five samples in all were taken. Hydroperoxides were determined for the same fuels and engine operating conditions as was ozone. Twenty-two separate determinations were made. In the road tests eye irritation was investigated for the deceleration cycle with 7 different fuels. Only 3 fuels were used for the other 3 cycles. Whenever a response time less than 10 seconds was observed at 5 ppm hydrocarbons, no higher levels were used. A total of 248 samples for eye irritation were collected. Aldehydes were determined at 5 ppm hydrocarbons and 1 ppm of NO2. 34 samples in all were run. Ozone and hydroperoxides were determined in a total of 36 determinations. In the plant damage experiments three fuels were evaluated. Calculated input hydrocarbon concentrations ranged from 1.1 ppm to 170.0 ppm. Measured residual concentrations ranged from 0.45 to 30.0. Plants used were spinach, petunia, poa annua, pinto beans, and oats. Damage was reported in terms of the presence or absence of typical or atypical symptoms. Damage was also reported in percent of injury for poa annua. Substantial increase in olefin concentration of gasolines used in Los Angeles would result in increased eye irritation and higher concentrations of reaction products, and low olefin fuels would result in improved visibility in the Basin. Low olefin fuels would result in lessened plant damage.##

03761

P. P. Mader, M. Eye, J. A. Orcutt, and L. A. Chambers

EFFECTS OF FUEL OLEFIN CONTENT ON COMPOSITION AND SMOG FORMING

CAPABILITIES OF ENGINE EXHAUST (INTERIM REPT. 2). Los Angeles County Air Pollution Control District, Calif. Apr. 1959. 24 pp.

A proportionate sampling system was used which made it possible to collect continuously representative composite exhaust samples from all all driving cycles in proportion to exhaust volume, under actual driving conditions. Six gasolines, with olefinic contents ranging from 1.0% to 30.9% were used (bromine number 1.6 to 49.4). The exhaust was irradiated for one hour by means of mercury lamps. A panel of laboratory personnel (usually eight in number, but never less than six) was then exposed to the contents of the flask by the use of a specially designed eye mask, which fitted the mouth of the flask as well as the eyes of the individual. The eye piece was built with a shutter to open and close quickly, thereby enabling an exact measurement of time of exposure. The number of seconds required for each individual to detect the initial eye irritation was recorded, and the arithmetic mean of the observations was calculated as an index of the eye irritation potential of the exhaust sample. The olefin content of the fuels used to drive the automobiles is directly related to the quantities and relative distributions of olefins in the exhaust. The amount of olefins present in the exhaust is directly related to the intensity of eye irritation which is produced when the exhaust gases are irradiated. Since a direct relationship exists between olefins in fuels and olefins in the engine exhaust on the one hand, and between exhaust olefins and eye irritation on the other, it is reasonable to assume that the determination of total exhaust olefin indicates the intensity of eye irritation that can be expected from a given fuel composition.##

04181

R. Inove, T. Iritani, H. Yanagisawa, G. Saito, and H. Maeda

ANALYTICAL STUDIES ON THE ATMOSPHERIC CONDITIONS INDUCED BY CO2-O2 ARC WELDING. Japan. J. Ind. Health (Tokyo) 1, (3) 218-23, June 1959. Jap.

A rise in temperature and a decrease in humidity were more noticeable with a CO2-O2 arc welding process using a new gas-shielded metal arc-welding method than with manual welding with covered electrodes. Experiments were conducted in a small cabin to analyze the atmospheric conditions created by this new method. The increase in carbon dioxide was not great although it was greater than in manual welding; this increase was caused by the natural ventilation associated with the rise in temperature. The level of carbon monoxide was raised, but only a little more than in other welding processes. The production of ultraviolet radiation was less than in other welding. The production of ozone and nitrogen dioxide was so slight that they would not cause poisoning. The quantity of dust produced was rather large, but was less than with welding with covered electrodes. In using CO2-O2 arc-welding processes in a small room, one must pay

attention to good ventilation of the room, but since this welding process is usually used in a large room with good natural ventilation, there are very few hygienic problems with regard to the process. (Author summary modified)##

04310

R. W. Gerstle and R. F. Peterson

CONTROL OF NITROGEN OXIDE EMISSIONS FROM NITRIC ACID MANUFACTURING PROCESSES. Air Eng. 9, (4) 24-8, Apr. 1967.

Abatement methods for the nitrogen oxide emission control nitric acid manufacturing plants are discussed. Presently available methods include catalytic reduction with certain fuels, absorption, adsorption and flaring. The catalytic reduction process is particularly suited to the pressure process of HNO3 manufacture in which the absorption tower tail gas is of uniform composition and flow, is under pressure, and can be reheated by heat exchange to the necessary reduction system inlet temperature. Efficiencies of above 90% are possible. In operation, the tail gases from the absorber are heated to ignition temperature, mixed with a fuel such as hydrogen or natural gas and passed into the reactor and through the catalyst. A number of reactions take place which result in the dissociation and decomposition of nitrogen oxides. Absorption towers with water as the absorbing medium are useful when NO2 emissions are in excess of 2%. Absorption in alkaline solutions such as Na2CO3 or NaOH is more effective than water, and nitrogen oxide removal may be as high as 90% with a well designed system. Adsorption of nitrogen oxides on silica gel or commercial zeolites is possible but not in use commercially. Flaring of higher concentrations of nitrogen oxides has found application commercially when there is an intermittent discharge of these gases. Plant operating variables which may affect the tail gas concentrations adversely include insufficient air supply to the system, low pressure in the system, especially in the absorber, high temperatures in the cooler-condenser and absorber, production of excessively high strength acid, operation at high through-put rates, and faulty equipment.##

04315

AUTOMOTIVE AIR POLLUTION (A REPORT TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206, THE CLEAN AIR ACT). 89th Congress (1st Session.) (Document No. 7.) 1965. 26 pp.

Based on the information presented in this report the following conclusions are made: (1) That all necessary steps should be taken to assure the reduction of pollutant emissions from motor vehicles. For this purpose, there is need for (a) further development of emission criteria, and (b) development of means for

insuring the national application of currently available technical knowledge for reduction of such emissions; (2) That the need should be recognized for an expanded automotive vehicle air pollution research program to accelerate further development of emission criteria and improve technical capabilities for controls on automotive vehicles; (3) That means be developed through vehicle inspection programs or otherwise to insure appropriate maintenance of vehicle emission control systems; and (4) That all practicable measures should be taken to expedite the flow of traffic in urban areas, since this will, in itself, accomplish significant reduction in vehicle pollutant emissions.##

04609

M. Kennebeck, Jr., R. Wetherington, D. A. Nole, H. Roby, and M. Y. Longley

TOXIC HAZARDS EVALUATION OF TITAN II TEST FIRINGS: METHODS AND RESULTS OF LABORATORY AND FIELD INVESTIGATIONS. Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio, Aerospace Medical Div. and Aerojet-General Corp., Azusa, Calif. (Technical Documentary Rept. AMRL-TDR-63-52.) (Aerojet-General Rept. 2552.) June 1963. 79 pp.

Toxicologically significant environmental contaminants near Titan II test-stand facilities were studied, with specially developed field and laboratory techniques, primarily to determine the degree of hazard associated with exhaust constituents. For exhaust products that were identified and quantitatively evaluated, it was found that normal test firings create no significant personnel hazard in test areas and that, with proper treatment procedures, no significant water-pollution problems are created. A method for determining Titan II test-firing contributions to a community-air-pollution situation was also developed. This study emphasizes the need for investigation of more refined atmosphere analysis techniques and instruments to determine trace contaminants resulting from static and dynamic missile firings. Detailed analytical methods for field samples containing unsymmetrical dimethylhydrazine, hydrazine, and nitrogen dioxide are presented. (Author abstract)##

04808

J. H. Ludwig

THE VEHICLE POLLUTION PROBLEM. Preprint. (Presented at the American Public Power Association Conference, Denver, Colo., May 8-11, 1967.

The problem of emissions from motor vehicles is reviewed from the standpoints of the contribution of vehicles to community air pollution, present progress in control regulations and application of devices, and the immediate and longer-term outlook for additional controls. (Author abstract)##

04995

F. L. Hall

PRODUCTS OF COMBUSTION OF GASEOUS FUELS. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 84-9.

Data on the combustion products of fuel gases is reviewed. Work on the photochemistry of smog is related to work on vapor phase gum produced in manufactured gas by hydrocarbons and NO2 catalytically oxidized from NO in the presence of butadiene.##

05007

J. H. Ludwig

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Preprint. 1967. 54 pp.

The various facets of the vehicle pollution problem from the standpoint of both effects on community atmospheres nationwide and the source of variables are summarized. The problems that remain today encompass a number of considerations, which may be enumerated as follows: (1) The importance of the diesel problem as it relates to smoke and odor control, the means for securing reduction of smoke and odors, and the development of test procedures for the setting of standards; (2) The importance of relative reactivity of the various organic species, particularly hydrocarbons, and the effects of reactivity on both standards and control methods; (3) The importance of various emission sources (exhaust, crankcase ventilation, fuel tank evaporation and carburetor evaporation losses) in relation to reactivity and need for control and the development of test procedures for these sources from all types of vehicles (passenger cars, trucks and buses); (4) The need for control of nitrogen oxides from vehicular sources, both gasoline engine and diesel engine power sources and concurrently for stationary sources; (5) The importance of instrumentation in measurement of pollution parameters for research, enforcement (certification) procedures, surveillance and inspection; (6) The problems of maintenance of devices on vehicles to insure their continued operation (surveillance and inspection), and/or the upgrading of such devices such that they will be essentially maintenance free; and (8) The importance of in-traffic carbon monoxide levels, particularly their significance relative to driver fatigue.##

05011

A. A. Orning, C. H. Schwartz, and J. F. Smith

MINOR PRODUCTS OF COMBUSTION IN LARGE COAL-FIRED STEAM GENERATORS . American Society Mechanical Engineers New York Paper 64-WA/FU-2.

(Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, New York City, Nov. 29-Dec. 4, 1964 .)

An analysis is given of the minor products of combustion from large coal-fired steam generators in relation to thermodynamic equilibria, unit design and operating conditions. Concentrations of nitrogen oxides and the ratios of sulfur trioxide to total sulfur oxides are near equilibrium values at the furnace outlet. Significant amounts of low molecular weight organic acids and comparatively small amounts of polynuclear aromatic hydrocarbons are found under good combustion conditions. (Author abstract)##

05097

R. E. Neligan

A COMPARISON BETWEEN THE HYDROCARBONS IN AUTOMOBILE EXHAUST AND THOSE FOUND IN THE LOS ANGELES ATMOSPHERE. Preprint. (Presented at the Joint Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5, 1961.)

Ambient air samples obtained from the central Los Angeles business district were analyzed by gas chromatography. Hydrocarbons in the C2-C7 molecular weight range were identified and their concentrations determined. The results obtained from these analyses are compared to those obtained from diluted automobile exhaust and diluted automobile exhaust that had been irradiated for a period of four hours. Gas chromatography was found to be an accurate reproducible procedure for the analysis fo C3 to C7 hydrocarbons present in the atmosphere. The procedure is limited by the inability to determine the methane concentration as well as the C8 hydrocarbons. In the sixteen samples analyzed, it was found that the relative concentrations of the individual hydrocarbon groups did not change significantly with total concentration. This would indicate that the hydrocarbon emissions to the atmosphere are relatively constant. A linear relationship was also found to exist between total hydrocarbons recovered and the sum of the nitric oxide - nitrogen dioxide levels. Comparison of atmospheric hydrocarbons to those produced by automobile exhaust indicates that natural gas could be a major source of the low boiling hydrocarbons present in the atmosphere. The relatively low acetylenic level found in the ambient air samples, as compared to diluted automobile exhaust, also indicate significant contributions are made by automobile blowby emissions as well as carburetor and fuel tank evaporation losses.##

05157

Los Angeles County Air Pollution Control District, Calif. (Sept. 1960). 83 pp.

EMISSIONS OF OXIDES OF NITROGEN FROM STATIONARY SOURCES IN LOS ANGELES COUNTY (REPORT 2: OXIDES OF NITROGEN EMITTED BY SMALL SOURCES).

This program was organized to study source groupings classified according to the discharge of oxides of nitrogen per unit of equipment, as follows: (1) large (those emitting over 100 lbs/hr.); (2) medium (those emitting 5 to 100 lbs/hr.); and (3) small (those emitting less than 5 lbs/hr.). This report discusses the evaluation of data obtained from tests made on small sources. It was calculated that the total weight of NO2 and NO emitted into the atmosphere in Los Angeles County from all small stationary sources averages 59 tons/calendar day during the 6 months' heating season (November through April) and 32 tons/calendar day during the remainder of the year. The weighted average of these amounts is 46 tons/calendar day. Of this weighted average daily discharge of NO2 and NO from all small stationary sources, slightly over half (27 tons) originates from gas-fired commercial and domestic appliances and the remainder (19 tons) from small industrial sources. Most of the NO2 and NO discharged from small industrial sources (approximately 16 tons/calendar day, weighted average) is produced by boilers of less than 500 horsepower rating. Most of the seasonal variations in the total weight of NO2 and NO discharged from small stationary sources are ascribable to the nearly two million residential space heaters, which vent 19 tons/calendar day during the heating season and none during the remainder of the year. A summary of NO2 and NO emissions for all small stationary sources is presented. Investigations of the sampling and analytical techniques employed showed that the chosen procedures and techniques produce reliable analytical results.##

05312

Chironis, N. P.

SMOG: THE DEADLY POISONS PERIL LIFE IN ALL CITY AREAS. Prod. Eng. 37, 33-41 (Dec. 19, 1966).

The air pollution problem is national in scope. Pollution-control officers continue to make a point of cracking down on offending factories, power stations, and incinerators. But, behind the scenes, the case against automotive contaminants is building up, and nothing less than a revolution in automotive engineering will satisfy tomorrow's standards. This design revolution is chartered for three stages: Modification of existing engines--improved carburetors, timing systems, cylinder-head design--and the addition of devices to burn off hydrocarbons and noxious gases. A search for new types of internal combustion engine--fuel injection engines, improved gas turbines, rotary engines. Entirely new propulsion systems that don't use fossil fuels--electric cars with batteries or fuel cells, linear motors for mass transportation systems, perhaps nuclear power either indirectly to charge batteries or directly to drive vehicles. It was indicated that pollutants from all sources amount to 135 million tons a year. So motor vheicles account for about 60 percent of the nation's

atmospheric wastes, by weight. Moreover, government figures indicate that vehicles are responsible for about 97 percent of the olefin hydrocarbons and 40 percent to 60 percent of the nitrogen oxides. Controls are aimed at three specific targets: emissions from the tailpipe, from crankcase ventilations, and from carburetor and gas tank evaporation. The tailpipe is by far the greatest source of emissions, accounting for up to 65 percent of the hydrocarbons and almost all the carbon monoxide and nitrogen oxides. But the crankcase emission is the easiest to control, and California chose it as the first target six years ago. These allow 275 ppm of hydrocarbons and 1.5 percent carbon monoxide by volume. Effective Jan. 1, 1970, however, California will cut these allowables to 180 ppm hydrocarbons and 1 percent CO. The state is also considering a proposal to adopt a standard of 350 ppm of nitrogen dioxide.

05411

E. S. Starkman

VARIOUS COMPONENT GASES OF ENGINE GENERATED POLLUTION POSE DIFFERING HEALTH HAZARDS. S.A.E. (Soc. Automot. Engrs.) J. 75, (3) 85-7, Mar. 1967

Unburned hydrocarbons, oxides of nitrogen, carbon monoxide, and carcinogens are among the emissions generated by engines. Each produces hazards of varying importance and each presents a different control problem. For example, the ultimate method of reducing the hydrocarbon emissions is to supply a completely stratified charge. As with the hydrocarbons, many engine variables influence the concentration of nitric oxide. Carbon monoxide concentration follows directly the fuel-air ratio, and a rich mixture operation must be avoided at all times. Reduction in carcinogen content should occur as the concentration of unburned hydrocarbons is reduced.##

05477

K. Gasiorovski

(ENERGY GENERATION FROM LIQUID FUELS.) Energieerzeugung aus fluessigen Brennstoffen. Gesundh. Ingr. (Munich) 86 (4), 116-22 (Apr. 1965.) Ger.

Air pollution due to oil-fired installations is caused by sulfur dioxide, carbon dioxide, nitrogen oxides, and products of incomplete combustion (carbon monoxide, hydrocarbons, ashes, and soot). Percentual share of these agents in flue gases produced from different fuel oils under various combustion conditions is given. Efficiency of high smoke stacks in dispersing SO2 is discussed and presented graphically. Statistical data are presented on share of automobile engines, domestic furnaces, and industrial furnaces in cities' air pollution due to SO2.##

05479

A. Goetz

AEROSOL FORMATION IN NATURAL AND POLLUTED AIR.
(Aerosolbildung in naturlichen und verunreinigten Luftmassen.)
Preprint. Ger. Tr. (Presented at the
Internationales Immissionsschutz Forum, Essen, Germany, 1966.)

The nature, type, and the effects resulting from modifications by aerosols of reactive gaseous constituents contained in the biosphere are reviewed. Aerosols modify the physical as well as the chemical reaction pattern of the molecular-disperse gaseous phase to a considerable degree in spite of the fact that the total mass of this colloid substance is minimal 10 to the minus 7th to 10 to the minus 8th compared to that of the gases which suspend the colloids. The increase in concentration of aerocolloids becomes obvious through a rapidly increasing visibility restriction due to contrast reduction by light scattering should also be considered. The growth of aerosols demonstrates the presence of reactive emission components by increased haze formation. It also has to be realized that the origin of the haze production is not necessarily tied to the locality of the pollution source because such reactions proceed relatively slowly, especially when different reaction partners originate at different localities or when a high particulate level is already present due to climate conditions. The formation of aerocolloids is by far not restricted to industrial and other man-made pollutions but results also from many processes in nature which go on continuously over the earth's surface in large variety. Consequently the final effect of emissions depends to a large extent on the geographical and climatic conditions and the natural aerosol levels, so that knowledge about their origin and formation rate is necessary to judge the final effect of various emission types over specific population areas. The sources, chemical and physical interactions , and methods for determining the size distribution of aerosols are considered.##

05599

J. Harkins and J. K. Goodwine

OXIDES OF NITROGEN IN DIESEL EXHAUST. J. Air Pollution Control Assoc. 14, (1) 34-8, Jan. 1964.

Equilibria NO-NO2 values for air-fuel ratios of 20, 25, and 30 at temperature-pressure conditions which bracket true engine conditions were obtained from diesel exhaust analyses. Even at the temperature of 4950 deg F, the NO2 values were only 40 to 80 ppm. The corresponding NO values were an order of magnitude higher than those found in an operating engine. Both NO2 and NO concentrations decreased as temperature decreased, so that at intermediate temperatures, more in line with engine temperatures,

very low NO2 values are to be expected. In the tests, truck engines were run on a chassis dynamometer. Both four-stroke cycle and two-stroke cycle engines were included. Both the total oxides of nitrogen and NO2 were determined by an UV SPECTROPHOTOMETRIC method. The exhaust probe was a 1/4-inch stainless steel line inserted into the exhaust stream. The exhaust was passed through an ice water condensate trap, then through two loosely packed glass wool filters, and was then pushed directly into the UV spectrophtometer by a carbon vane pump. Nitric oxide concentrations were 1100 ppm or less depending on engine load. No NO2 concentrations greater than 60 ppm were found. Higher values can be obtained when the exhaust flow is interrupted and held in a sampling system. Extreme care must be taken in handling diesel exhaust if correct measurements for NO2 are to be made. Also, it was found that NO2 emissions in diesel engines are much lower than reported by others and are, in fact, more in line with equilibrium predictions.##

05649

Smith, I. D.

NITROGEN TETROXIDE DISPOSAL UNIT COMBUSTION PRODUCTS. National Aeronautics and Space Administration, Las Cruces, N. Mex., Manned Spacecraft Center. May 1967. 7pp. (Rept. No. NASA TN D-3965.)

A test program was conducted to determine the identity of the combustion products released to the atmosphere by the vapor disposal units which dispose of nitrogen tetroxide by burning with propane. The burner unit, which is designed to dispose of at least 10 lb of nitrogen tetroxide per minute, consists of an injector system for the propane and the nitrogen tetroxide, a mixing chamber, a burner head constructed to minimize flashback, and a spark-plug igniter system controlled from a blockhouse. Samples of the combustion products were collected and analyzed by infrared spectroscopy. When the unit was operated in the normal, slightly fuel-rich mode, the detectable combustion products were carbon dioxide, water vapor, and unburned propane or other carbon-hydrogen bond-containing materials. The hydrocarbon emission, which would be undesirable in a smog-prone area, can be controlled to a degree by adjustment of the propane feed. The propane adjustment becomes important when disposing of an oxidized feed that continuously diminishes in nitrogen tetroxide. The combustion products do not contain any materials which present any toxicity problems. After a year of usage, the White Sands Test Facility concludes that the disposal units provide a convenient, rapid, and safe method for the disposal of excess nitrogen tetroxide.

05815

C. G. Segeler

THE GAS INDUSTRY AND ITS CONTRIBUTION TO AIR POLLUTION CONTROL. Preprint. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

Two facts are demonstrated here: first that the use of natural gas produced negligible air pollution if any; and second that natural gas is available under such economic conditions that its use will expand. Beginning with the first fact, the constituents of natural gas are discussed. A trace constituent of primary concern in utility delivered gas (97% natural gas) is sulfur which is the result of an odorant added for the detection of gas. Sulfur is present at a concentration of approximately six parts per million. Total sulfur in the combustion products of a million lbs. of natural gas amounts to only 37 lbs. The formation of NO at high flame temperatures and its subsequent oxidation to NO2 at lower temperatures is not an intrinsic fuel property but is influenced by the conditions of combustion. Values for residential, industrial and commercial production of nitrogen oxides by combustion of natural gas are given, based on utility company gas distribution. Information on emission of nitrogen oxides vehicles is given as a frame of reference. Application of laboratory investigations of emissions from equipment and their interpretation are discussed. A proposed plan for improving industrial safety using group organization with annual inventories and reports is discussed. The following specialized application of gas in air pollution control are discussed: (1) domestic incineration, (2) destroilet, (3) flue fed apartment incinerators, (4) industrial boiler plants, and (5) commercial and industrial incinerators. Application in smoke control by reclaiming operations, research on an appliance for consuming kitchen grease vapors; and catalytic fume oxidation systems are discussed. As for the availability of natural gas, a brief survey of its consumption and reserve statistics is presented.##

05864

S. S. Griswold, R. L. Chass, R. E. George, and R. G. Holmes

AN EVALUATION OF NATURAL GAS AS A MEANS OF REDUCING INDUSTRIAL AIR POLLUTION. J. Air Pollution Control Assoc. 12 (4), 155-63, 208 (Apr. 1962). (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

Fuel oil burning contributes greatly to the total atmospheric loading of significant air contaminants. Fuel oil also is a major source of oxides of nitrogen, an important participant in photochemical smog occurrences and a toxic substance in itself. The cleanliness of the atmosphere is affected by the aerosols emitted directly from fuel oil burning sources and particularly by such large fuel users as power plants. The presence of sulfur dioxide greatly increases the amount of aerosols created by the photochemical reactions between hydrocarbons and oxides of nitrogen. Burning fuel oil acts in three ways to impair the visibility: (1) it emits aerosols directly; (2) it emits oxides of nitrogen to take part in the photochemical reaction; (3) it provides sulfur dioxide to help make these photochemical reactions more potent producers of still more aerosols. In addition to the deleterious effects on visibility, fuel oil burning results in

(1) esthetically offensive opacity violating plumes, and (2) damage to vegetation. The contribution by power plants to these typical manifestations of smog in Los Angeles County would measurably be reduced by the substitution of natural gas in place of fuel oil.##

05893

J. V. Scaletti, C. E. Gates, R. A. Briggs, L. M. Schuman

NITROGEN DIOXIDE PRODUCTION FROM SILAGE. I. FIELD SURVEY. (Agron. J.) 52, 369-72 (1960).

Since exposure to silage gases constitutes a distinct occupational hazard to farmers, a study was undertaken to determine the extent and frequency of NO2 production from silage in Minnesota through a state-wide silage survey and to relate, if possible, production of this gas with various agronomic practices and environmental conditions existing during the period of the study. In the survey (1957 and 1958) 1,219 questionnaires were completed for individual silage crops. Actual objective NO2 determinations were made shortly after filling time on 332 silage crops. The remaining 887 (mail) questionnaires were presumably biased and consequently were not weighted heavily. NO2 gas was found in 42% of the 332 silos in the detailed study. The presence or absence of NO2 was found to be significantly related to county for corn and oats as well as for both years. Those counties with the heavier soils showed a greater response rate. The level of organic matter and potassium present in the soil at the time of ensiling affected NO2 production consistently over crops and years for organic matter, but to a lesser extent for potassium. The higher the amount of organic matter, the greater the number of positive tests for NO2 obtained. Intermediate levels of available potassium ion in soil appeared related to NO2 production. Although not as clearly demonstrable, lower levels of phosphorus led to an excess of positive tests for NO2. Only 1 of 21 silos containing sodium metabisulphite as a preservative showed evidence of NO2 production. No relationship to the objective measure of the production of NO2 was shown by the following factors: crop, amount and method of application of other preservative, amount of organic (manure) or inorganic fertilizer added to the soil at time of planting, crop condition, time elapsing after cutting before ensiling, and method of chopping. (Author summary modified)##

05912

Larsen, R. I.

MOTOR VEHICLE EMISSIONS AND THEIR EFFECTS (CONFERENCE REPORT). Public Health Rept. (U.S.) 77(11), 963-9 (Nov. 1962) (Presented at the Annual Meeting, New England Section, Air Pollution Control Association, Worcester, Mass., April 25, 1962.)

Highlights of the papers presented at the Fifth Air Pollution Medical Research Conference on December 4, 1961, and at the Joint Research Conference on Motor Vehicle Emissions and Their Effects on December 5-7, 1961 are presented. Current research findings on quantities and types of air pollutants from motor vehicles and the effects of these pollutants on the health of man, plants, and laboratory animals are reviewed.

05970

T. J. Connolly and K. Nobe

INCINERATION STUDIES: FORMATION OF OXIDES OF NITROGEN IN GAS FIRED HEATERS. (In: First report of air pollution studies.) ((California Univ., Los Angeles, Dept. of Engineering.)) (Rept. No. 55-27.) (July 1955). 29 pp.

The results are presented of an investigation of the possibilities of reducing the production of these oxides. A review of the thermodynamics and kinetics of oxides of nitrogen formation and decomposition has been made. Measurements of the concentration of these oxides in the flue gases of a household gas-fired water heater were made. Experiments were performed to collect data on possible variation in oxide concentration within the flue pipe of the heater. The principal constituent of oxides of nitrogen within a heater or furnace appears to be nitric oxide, NO. This compound is probably oxidized to nitrogen dioxide, NO2, in the atmosphere. Equilibrium concentrations of these oxides in flue gases at various temperatures have been calculated and are presented. Measurements made in this work, as well as in previously published information, show that the actual concentration of oxides of nitrogen are far in excess of equilibrium concentration. The water heater tested here emitted about 8 pounds of oxides per ton of fuel. A study of some reaction rate data indicates that the formation of nitric oxide at flame temperatures can be explained by the homogeneous reaction kinetics. It appears, however, that any decomposition that may occur at lower temperatures must be surface-catalyzed or heterogeneous since the homogeneous reaction rates would not account for significant decomposition. The data obtained on measurements of oxides of nitrogen concentration at various points in the flue pipe of the water heater did not furnish conclusive evidence of any change. (Author summary modified)##

06086

R. L. Stenburg, R. R. Horsley, R. A. Herrick, A. H. Rose, Jr.

EFFECTS OF DESIGN AND FUEL MOISTURE ON INCINERATOR EFFLUENTS. J. Air Pollution Control Assoc. 10 (2), 114-20 (Apr. 1960). (Presented at the 52nd Annual Meeting, Air Pollution Control Association, Los Angeles, Calif., June 21-26, 1959.)

Tests were made to determine the effects of fuel moisture

content on pollutant emissions from an experimental incinerator of fixed dimensions while varying (1) the amount and distribution of combustion air, and (2) the burning rate as measured by the amount of fuel charged per hour. Overfire combustion air was introduced into the front of the ignition chamber at the grate level, and swept the surface of the burning fuel bed. Underfire air entered through the ash pit and passed up through the fuel bed. Secondary air was introduced through a duct built into the top of the bridge-wall and was discharged through a series of ports opening into the top of the mixing chamber. Dry components of the fuel include equal parts, by weight, of newspaper and corrugated cardboard, mixed in a ratio of three to one with wood chips. Chopped potatoes were substituted for leafy vegetables as the wet component because of their year-round availability. Five-pound charges were prepared with the wet-to-dry components adjusted to provide a fuel with an average moisture content of either 25 or 50%. Particulate, oxides of nitrogen, hydrocarbons, carbon monoxide, and smoke were measured. Because of the basic physical and chemical laws involved, factors demonstrated by this study as affecting the increase or decrease of air pollutants should be the same as those affecting production of pollutants from larger scale incinerators.##

06104

Swartz, D. J., K. W. Wilson and W. J. King

MERITS OF LIQUEFIED PETROLEUM GAS FUEL FOR AUTOMOTIVE AIR POLLUTION ABATEMENT J. Air Pollution Control Assoc. 13 (4), 154-9 (April 1963). (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The purpose of this investigation is to establish trends and to present some material which could be both interesting and revealing as regards the use of LPG as a motor fuel. Particular emphasis is directed towards its potential for reducing atmospheric air pollution. A major result of this investigation is to provide new data emphasizing the striking differences in the composition of exhaust gas from similar engines operating on Liquefied Petroleum Gas fuel as contrasted with their operation on gasoline. Tests show that in the case of LPG exhaust there are essentially no heavy hydrocarbons (C4 or greater) present. Since the olefins are the worst offenders as regards smog formation from gasoline exhaust, the absence of heavy olefins in LPG exhaust suggests the possibility of a significant reduction in automotive smog if enough vehicles in a given area use LPG fuel. The scaled fuel system offers an additional advantage by eliminating the evaporation of fuel to the atmosphere, which is currently a source of added expense to the motorist as well as adding to the total amount of air pollution from cars.

06280

Folke Hedlund, Gustav Ekberg, Sten Erik Mortstedt

DIESEL EXHAUST GASES. INVESTIGATION WITH PROPOSALS FOR ACTION. (Communications Dept., Stockholm, Sweden, Guidance Group Concerning Development Work in the Field of Motor Vehicle Exhaust Gas, Sept. 1967. Translated from Swedish. Joint Publications Research Service R-8943-D, 74p., Dec. 12, 1967. 27 refs.

Diesel exhaust emissions and methods of controlling these emissions in Sweden are reviewed. The diesel engine differs from the gasoline engine in several respects, which have a decisive influence on the pollution it emits. It uses a fuel that is less volatile than gasoline. It normally works with a higher excess of air (leaner mixture) and the devices for feed and ignition of the fuel are quite different. Due to the discharge by individual vehicles of dense smoke and by the discharge of foul-smelling substances they have been pointed out by the public as qualified air polluters. Poor maintenance of the engine or intentionally wrong pump adjustments can result in the giving off of such dense smoke that this can constitute a hazard for overtaking vehicles due to impaired or obscured visibility. Diesel engines can give off various types of smoke. One type is the heavy load smoke, which arises through load on a hot engine. Exhaust gases from diesel vehicles, especially under certain driving conditions, contain substances that are irritating to eyes, nose and throat. These include: oxides of nitrogen, hydrocarbons, polycyclic aromatic hydrocarbons, carbon monoxide and sulfur dioxide. The smoke from a diesel engine can be limited by various measures, undertaken on the engine or the fuel pump, the fuel, and finally on the exhaust gases. Regular maintenance of the engine is necessary to keep the smoke values at the lowest possible level. Current and proposed regulation of diesel exhaust emissions are discussed.##

06300L

CHARACTERISTICS AND PHOTOCHEMICAL REACTIVITY OF VEHICULAR EMISSIONS. (Section VII of air pollution research progress report for quarter ended December 31, 1966.) Bureau of Mines, Pittsburgh, Pa., Coal Research Center, 1966, pp. BM/63-BM/67.

The effects of halogens, SO2, and humidity on reactivity of a standard ethylene plus NO plus air mixture were studied. The results showed no effects on the system's chemical reactivity as a result of the presence of halogen and SO2; the ozone meter's response to oxidant and NO2, however, was reduced in the presence of SO2. Humidity was found to interfere with the chemical processes in a way that affected significantly the reactivity-measurement results. Further studies on background reactivity in the irradiation chamber showed that the background oxidant formation result of photochemical reactions involving NOx and hydrocarbon at extremely low concentrations. (Author summary)##

06627

G. B. Phillips

POSSIBLE APPLICATIONS FOR RESEARCH ON ATMOSPHERIC AIR IONS AT THE BIOLOGICAL LABORATORIES. Army Biological Labs., Frederick, Md., Safety Div. (Feb. 1962). 41 pp.

This study was designed to point out areas of research in air ionization that may be of interest at the Biological Laboratories. Three general areas of application are represented: (a) Applications of air ions that may be connected in some way with mechanisms of air-borne disease, the stability of air-borne particles, organism virulence or infectivity, production methods for tissues and organisms, or dissemination methods. These would be considered to be directly related to the mission of Biological Laboratories. (b) Applications of air ions that are related to the cryptoclimates in which laboratory experimentation is carried out. Here we would be concerned to determine if the presence or absence of air ions (which may be produced or removed in air-conditioned buildings, aerosol chambers, UV animal rooms, etc.) is creating any unrecognized effects on the test results. It may also be important to determine how the ionization densities of our test environments differ from the natural environment. (c) Applications of air ions that are related to the performance of individuals in laboratories. Inasmuch as human reaction time and other performance indexes seem to be somewhat affected by air ions, such applications may be related to laboratory safety or to work efficiency. It is recommended that atmospheric air ion studies be considered for inclusion in the biological research program. Abstracts of current research on air ions are included in the Appendix.##

07178

Doyle. G. J. and N. A. Renzetti

THE FORMATION OF AEROSOLS BY IRRADIATION OF DILUTE AUTO EXHAUST. J. Air Pollution Control Assoc., 8(1):23-32, May 1958. 17 refs. (Presented at the 132nd Nat. Meeting, Amer. Chem. Soc., New York, N.Y., Sept. 8-13, 1957.)

Laboratory examinations of diluted auto exhausts were used in the study as a method of determining whether aerosols form as a consequence of photochemical reactions which are induced to occur in this medium. The system used allowed investigation of the dependence of aerosol formation on the composition of the dilute exhaust and the determination of some of the properties of the generated aerosol. The controlled variables were the concentrations of four types of exhaust (idle, acceleration, cruise, and decleration), relative humidity, temperature during irradiation (27 plus or minus 2C), and light intensity (near ultraviolet which is comparable to noon sunlight on a winter day).

The aerosols in the exhaust-air mixtures were studied by means of a counter photometer and a nuclei counter. Aerosol can be formed by irridiation of dilute auto exhaust.. Within the range of concentrations studied, aerosol formation is favored by increasing the concentration of deceleration exhaust, and, to a lesser degree, by increasing the concentration of oxides of nitrogen.. The aerosol so formed is in the submicron size region but is of sufficient concentration and size to reduce visibility appreciably and to increase the mass concentration of aerosol.##

07451

Scharf, P. B., B. B. Goshgarian, H. M. Nelson, and G. L. Hody

THE MEASUREMENT OF THE EXHAUST COMPOSITION OF SELECTED HELICOPTER ARMAMENT. Air Force Rocket Propulsion Lab., Edwards AFB, Calif. and Army Aeromed. Res. Unit, Fort Rucker, Ala., Proj. No. 3A0 2560 1A 819, Task No. 051, Rept. No. AFRPL-TR-67-203 and USAARU-67-10, 46p., June 1967. 4 refs.

A study of the exhaust composition of rapid fire machine guns and rockets has been conducted. Methods of analysis were evaluated and exhaust compositions for the 50 cal and 7.62mm machine gun and the 2.75" rocket were determined. A rapid scan infrared spectrophotometer was used for immediate examination of effluent gases in order to detect reactive species. The exhaust gases were analyzed at concentrations as high as 1000 times those present in helicopters to minimize the chance of missing any significant toxic product. A qualitative and quantitative analysis of gas phase and aerosol components is given. It may well be that the proportion of carbon monoxide in the exhaust is so high that permissible exposure times can be selected on the basis of its concentration alone while still limiting exposures to all other toxic materials to safe leevls. However, significant amounts of nitrogen dioxide, ammonia, carbonyl sulfide, hydrogen cyanide, lead and copper were found.##

07623

Larson, Gordon P., John C. Chipman, and Erwin K. Kauper

DISTRIBUTION AND EFFECTS OF AUTOMOTIVE EXHAUST GASES IN LOS ANGELES. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964. p. 7-16. 12 refs. (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1955)

Hydrocarbons or gasoline vapors are known to be an important factor in producing several of the deleterious effects of smog, however, one question to be answered is whether or not the removal of hydrocarbons from all other sources in the community would relieve

the burden on the air sufficiently to avoid any control measures on auto exhaust. The measurements of the quantity of hydrocarbons emitted by internal combustion engines another source of hydrocarbons contributing to the buildup were explored. The areas of exhaust gas concentration buildup were determined by a study of Los Angeles traffic. Studies now clearly show that removal of all other sources of hydrocarbons from refineries and from the distribution of gasoline will not lower the concentration of hydrocarbons in downtown Los Angeles area and the north-central section of the County sufficiently to relieve the eye irritation, crop damage effects, and high ozone content of the air in those areas. The Air Pollution Control District recommends that engineering studies seeking to remove hydrocarbon vapors from exhaust gases should strive for a 90% overall removal under conditions of operation experienced in heavy traffic.

07625

Haas, G. C.

THE CALIFORNIA MOTOR VEHICLE EMISSION STANDARDS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 39-44. 5 refs. (Presented at the National West Coast Meeting, Society of Automotive Engineers, Aug. 1960).

The legal and technical bases of the California standards are reviewed and the air pollution laws of California summarized. The evolution of air quality standards is described. The translation of air quality standards into motor vehicle emission standards is described along with a statement of the underlying assumptions concerning the relationship of the photochemical smog effects to the atmospheric concentrations of primary pollutants emitted to the atmosphere from motor vehicles and other sources. Driving cycles, analytical methods, evaluation of device warmup characteristics, and related problems are also discussed.

07629

Way, Gilbert, and W. S. Pagley

FIELD SURVEY OF EXHAUST GAS COMPOSITION. In: Vehicle Emissions SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 102-120. (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1958.)

The operations and results of a comprehensive field survey conducted in Los Angeles are reported. The purpose was to measure exhaust emissions from a representative group of cars during operating conditions encountered in metropolitan driving. Two hundred and ninety-three cars were tested under a schedule of driving conditions which included a variety of accelerations, cruise speeds, decelerations, and idle. During the test cycle, exhaust gases were continuously analyzed by the Model 28 Liston-

Becker spectrometer for CO, CO2, and unburned hydrocarbons and by Model 15 Liston-Becker spectrometer for hydrocarbons. Airflow was measured continuously by the viscous airflow meter. Indications from these instruments were registered by a recording oscillograph. An oscillogram processor was used on location for developing the 10,000 ft of recordings taken during the test. Oxides of nitrogen were determined by analyses of grab smaples taken during the acceleration and cruise cycles. A description is given of preparatory operations; survey operations including instrumentation, test procedure, test cycle, and supporting operations; data handling and calculations; and test results. Details and examples of calculations of results and confidence intervals, along with calibration charts for the instruments used are appended.

07690

Cominelli, A.

AN EASILY CONTROLLABLE AIR POLLUTION SOURCE: NAPHTHA ENGINES. ((Una fonte di inquinamento atmosferico che e relativamenta facile controllare: i motori a nafta.)) Text in Italian. Ann. Sanita Pubblica (Rome), 28(2):367-375, March-April 1967. 9 refs.

The exhaust from diesel engines (naphtha engines) in contrast to that from gasoline engines is not usually an important source of air pollution. When in good condition and operated properly it emits less toxic gases (CO and hydrocarbons) than a spark ignition engine. Atmospheric pollution from diesel engines depends to a large extent upon the driver as well as on the mechanical condition of the vehicle. Public education is needed and punitive action against offenders. Switzerland has established norms to prevent vehicular air pollution: rapid acceleration and deceleration must be avoided, overloading is forbidden, the vehicle must be frequently checked and kept in excellent working condition. Black exhaust fumes quickly identify an offending vehicle. Maximum permissible opacity for the exhaust fumes can be established by the use of opacimeters. The ideal opacimeter should be ruggedly made to withstand all road conditions and the 700 deg. C temperatures of the gases emitted, it should be easily installed and easily read on either a stationary vehicle or a moving one. The most frequently used types (Hartridge, UTAC, Bosch) and the advantages and disadvantages of each are discussed. Permissible values (Hartridge) are given for different types of vehicles. A schematic drawing is given of the Bosch opacimeter.

07979

L. G. Austin

FUEL CELLS: A REVIEW OF GOVERNMENT-SPONSORED RESEARCH, 1950-1964. North Carolina State Univ., Raleigh, Dept. of Chemical Engineering, NASA-SP-120, 439 p., 1967.

Fuel-cell investigations funded by Government agencies of the United States of America are reviewed. Primary Navy interest is in more buoyant submarines; Army interest concerns silent frontline power and more efficient use of fuel for motive power. Both services need silent, portable electric generators. The Air Force and NASA share the desire for minimum-weight spacepower systems. The Advanced Research Projects Agency of the Department of Defense considered direct energy conversion important enough to carry multimillion-dollar Project Lorraine for several years, which included sizable funds for fuel-cell work. In addition, the Atomic Energy Commission is looking into thermally regenerative fuel cells as possible adjuncts to nuclear power plants. The high fuel efficiency of fuel cells is a major advantage in vehicle propulsion. The fuel efficiency of military vehicles is probably no greater than 15 to 25 percent and a fuel cell unit with an efficiency of 50 percent would have a great impact on the logistics of fuel supply. Only cheap fuels with a high specific energy (Btu/lb or Btu/gal) can be considered. The powerplant must be efficient and capable of (-54 degrees C), and have reasonable weight and size. Electric motors have excellent overload capability and can be run at several times its continuous rated capacity for periods of minutes. Therefore, electric motors probably need only about one-fourth of the nominal rating of gasoline engine; e.g., 28 kilowatts to replace 150 bhp. Power densities of 2kw/cu ft and 22 W/lb for fuel cells have been cited as requirements for vehicle propulsion (assuming 60 percent efficiency), but could be too low by a factor of 3. (o present direct or indirect hydrocarbon fuel cells satisfy these requirements.##

08033

J. V. Pustinger Jr., and F. M. Hodgson

IDENTIFICATION OF VOLATILE CONTAMINANTS OF SPACE CABIN MATERIALS. Monsanto Research Corp., Dayton, Ohio, Contract AF 33(615) - 3377, Proj. 6302, Task 630202, AMRL-TR-67-58, 164p., June 1967.
CFSTI, DDC: AD 658203

Ninety eight candidate materials for space cabin construction were tested to establish possible volatile gas-off and oxidation products. These materials could be potential cabin contaminants. Test conditions were designed to simulate the normal space cabin environment. After pretreatment at 0.1 torr and at 25 degrees C, candidate materials were stored in bench-scale simulators for 14 days at 68 degrees C, and for 30, 60, and 90 days at 25 degrees C, in a 5 psia oxygen atmosphere with 20-40% relative humidity. Individual components of the volatile contaminants were identified and the quantities evolved were estimated by gas chromatographic and mass spectrometric analyses. Paints and coatings, prepared immediately before testing, gave off considerable amounts of entrapped solvents. Lesser, but significant, amounts of contaminants result from oxidation and from hydrolysis. In some cases, larger increases in carbon monoxide levels were observed when the storage temperature was increased from 25 degrees C to 68

degrees C. In addition to the gas-off experiments, a cryogenic system for serial trapping of atmospheric contaminants was constructed. Gas chromatographic and mass spectrometric analyses were performed on four samples of atmospheres from bio-environmental systems. (Authors' abstract, modified)##

08165

Nedogibchenko, M. K.

PRESENT DAY CONDITIONS OF ATMOSPHERIC AIR POLLUTION BY AUTOMOBILE EXHAUST GASES IN CITIES AND PROBLEMS OF ITS CONTROL. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 195-199, May 1960.
CFSTI: TT 60-21475

Air quality measurements in Russian cities indicated that carbon monoxide was the most important automotive exhaust pollutant. In Moscow, maximum concentrations of carbon monoxide reached 100 - 200 mg/cu m; in Leningrad 145 to 164 mg/cu m; in Saratov 20 to 60 mg/cu m; In Perm 40 to 60 mg/cu m, and in Ivanova 18 to 88 mg/cu m. In Sverdlovsk the lead content in the exhaust gases ranged between 0.069 to 3.70 mg/cu m, depending upon the made of the motor vehicle. Investigations in Moscow in connection with the utilization of ethylated gasoline by the passenger auto transport revealed only from 0.001 to 0.003 mg/cu m of lead in the street air. Investigations disclosed in auto transport exhaust gases the presence of a polycyclic hydrocarbon, 3, 4-benzpyrene, generated at the rate of 0.75 mg/min. According to most recent reports auto transport exhaust gases were polluting atmospheric air also with nitrogen oxides; the more incomplete was the gas combustion the greater was the quantity of formed carbon monoxide and less of nitrogen oxides were emitted into the air; vice versa, the more complete the gas combustion the less CO was formed and the more nitrogen oxides were discharged into the air. Next in importance to air pollution with carbon monoxide is air pollution with soot discharged in large quantities with automobile exhaust gases. The cause of this type of atmospheric air pollution lies in the unsatisfactory technical construction and mechanical and functional adjustment of the engines. The reduction of city air pollution caused by auto-transport exhaust gases should be carried out along the following basic lines: Improvement in the design of automobile motors and carburetors with a view to increasing degree of combustion and of gasoline utilization. Development of methods to render harmless exhaust gases emitted by auto-transport engines, preferably by oxidizing them to smaller non-harmful or less harmful molecules.##

08376

Piero, George W.

SOLVENTS, SMOG AND RULE 66. J. Am. Soc. Lubrication Engr.,

23(11):448-458, Nov. 1967. 29 refs. (Presented at the 22nd ASLE Annual Meeting, Toronto, Canada, May 1-4, 1967.)

Solvents and cleaners evaporate into the air and some of them may become pollutants. Their quantity, however, is relatively small and their photochemical reactivity is relatively low. Since, however, certain solvents when tested in smog chambers at relatively hihg concentration (4ppm) do produce eye irritating products, their use is restricted in Los Angeles by Rule 66 and in the San Francisco Bay area by Regulation 3. These are discussed in detail. The topographical and meteorological characteristics of these locations are unique. Therefore, such restrictions should not be imposed in other localities until a thorough study is made to determine the extent, if any, which solvents may contribute to smog.

08377

Parker, Charles H.

PLASTICS AND AIR POLLUTION. Soc. Plastics Engr. J., 23(12):26-30, Dec. 1967. 24 refs.

General information is given on the air pollution cycle and common types of air pollutants and their sources. Photochemical pollutants are of most interest in synthetic resin and polymer technology. A recent survey showed that in the Los Angeles District, 550 tons per day of organic materials were emitted from organic sol vent usage as of Jan. 1965. Plastics, rubber, adhesives, and putty contributed 45 tons per day. In their respective forms of plastic, coating binder, or related products, synthetic resins or polymers are created from building blocks stemming from fundamental pro ducts such as petroleum, natural gas, coal, fixed nitrogen, oxides of carbon, and others. At each stage of conversion, from the fundamental products to a resinous consumer product and its disposal, there are air pollution problems to solve which involve research expenditure. Information is also given on factors to consider when evaluating the presence of a potential air pollution hazard resulting from the manufacture or use of synthetic resins, polymers, or elastomers. The main points are given of Senator Muskie|s bill (S.780) on air pollution. It is poined out that most states have some form of air pollution legislatiсn either pending or in effect. Factors are given which must be considered when estimating the costs oa applying air pollution ontrol techniques. These include the recovery of useful materials and tax benefits.

08497

Hoffman, Heinz

EXHAUST GAS PROBLEMS WITH GASOLINE AND DIESEL ENGINES. II. DIESEL ENGINES. ((Abgasprobleme bei Otto- und Dieselmotoren. II. Dieselmotoren.)) Text in German. Erdoel Kohle (Hamburg), 20(9):644-648, Sept. 1967.

The various pollutants present in the smoke produced by diesel engines were measured and discussed. The results, illustrated in tables and graphs, show that CO emission is only 1/10 that allowed for gasoline engines and is therefore of minor importance. Aldehydes with their characteristic irritating odor are also produced in small quantities and are considered annoying, but medically unimportant. The nitrogen oxides, NO and NO2, are produced in sufficiently large quantities to cause lack of oxygen in the blood, and inflammation of the respiratory tract. The antechamber motor produces fewer nitrogen oxides than the direct injection motor. Amount of SO2 produced is negligible. 3,4-Benzopyrene is emitted in significant quantities when an engine emits a large quantity of smoke and then only if the motor is run under high pressure. As a control measure a reduction in smoke quantity is recommended. The smoke characteristics can also be greatly influenced by the design of the combustion chamber and proper maintenance of the engines.##

08524

Kapkaer, E. A., L. V. Trofimova, N. A. Evikeeva, and A. K. Monkevich

HYGIENIC EVALUATION OF SOME PETROCHEMICAL INDUSTRIES. ((Gigienicheskaya otsenka nekotorykh neftekhimicheskykh proizvodstv.)) Text in Russian. Gigiena Truda i Prof. Zabolevaniya (Moscow), 10(11):22-28, Nov. 1966. 10 refs.

Deficiencies in planning and actual operation of petrochemical plants are responsible for the discharge of acetylene, polyethylene, phenol, acetone, methylstyrene, isoprene, divinyl and other toxic complexes which are products of decomposition, oxidation, and hydrolysis. Desorption of toxic substances from construction materials (concrete brick) plays an important part. The authors recommend methods for improving working conditions in petrochemical production facilities. (Authors' summary, modified)

08553

Coffman, Q. H.

SOUTHERN CALIFORNIA AEROSPACE INDUSTRY'S PROGRAM TO CONTROL SMOG PRODUCED BY CHEMICAL MILLING MASKANTS AND SHOP PROTECTIVE COATINGS. S.A.E. (Soc. Automovite Engrs.), Preprint 670816, 10p., 1967. (Presented at the Aeronautic & Space Engineering & Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

The materials, test criteria results, and conclusions for chemical milling maskants an d hand-peelable shop protective coatings which comply with Rule 66 of the Los Angeles County Air Pollution Control District (APCD), and are used by the aerospace industry in Southern California are discussed. The maskants were evaluated to determine

the material best suited under Rule 66 to perform chemical milling, and the shop protective coatings were evaluated to determine the material best suited for protecting metal surfaces during fabrication, adhesive bonding, and assembly operations. (Author's abstract, modified)

08557

George, J. C. and G. R. Morris

AVAILABILITY AND EVALUATION OF NONPHOTOCHEMICALLY REACTIVE PRIMERS AND TOPCOATS FOR AEROSPACE APPLICATIONS. S.A.E. (Soc. Automotive Engrs.), Preprint 670814, 7p., 1967. (Presented at the Aeronautic & Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

New coatings with low smog producing potential have been and are continuing to be evaluated for use in the aerospace industry. These new coatings have been proved in laboratory and shop testing to be equal in quality to the conventional coatings they are replacing. Environmental exposure tests to date are satisfactory and are continuing. However, difficulty has been encountered in obtaining consistent quality in large production batches. Some of the new coatings contain solvents that are slightly more toxic. Also, some of the modified coatings have lower flash points. These new materials, which include both proprietary and military coatings, appear to be readily available. Coating costs of the new materials generally are higher, but vary from a reduction of approximately 7 percent to an increase of 35 percent. (Authors' abstract)

08591

Yamaki, N.

SEVERAL PROBLEMS ON CONTROL OF MOTOR VEHICLE EXHAUST POLLUTION. Text in Japanese. J. Japan. Petroleum Inst. (Tokyo), 8(9):686-696, Sept. 1965. 31 refs. (

Effedcts of Automobile exhaust gases upon air pollution in Tokyo and Osaka are evaluated. Numbers of vehicles, population density of automobiles, and average amounts of gasoline consumption per square kilometer per day for Tokyo, Osaka, and Japan are tabulated Average and maximum amounts of carbon monoxide and lead concentrations in Tokyo and in Japan are discussed, with reference to those of Los Angeles. Smogs are more frequent in Tokyo and Osaka during winters and they have been known to be caused by stack gases and smokes from factory chimneys. The effects of automobile exhaust gases upon smogs for both cities have not been clarified. The frequencies and distributions of smogs, year to year, in Tokyo and Osaka have been changing in recent years, as petroleum fuels have replaced coal. Subjects such as quality of auto exhaust gas for different driving conditions, actual field survey of exhaust gases, exhaust control devices, and other activities being conducted in the United States, are reviewed.

08633

Cleary, Graham J.

AIR POLLUTION AND THE AUTOMOBILE. Clean Air (J. Clean Air Soc. Australia New Zealand) 1(1):7-9,11, June 1967. 18 refs.

The magnitude and nature of the emissions from automobile engines are examined. Most of the pollution is discharged through the tail pipe (about 60 percent on a total hydrocarbon basis), but crankcase emissions (30 percent) are also appreciable. The remaining ten per cent is made up of evaporation losses from the fuel tank and from the carburettor after the engine has stopped. Eye irritation, plant damage and cracking of typre rubber have been found in communities heavily polluted by automobile exhaust products. Control measures to minimize pollution are considered. These involve burning the exhaust gases from the tail pipe by means of either thermal or catalytic afterburners, and recycling the vent gases from the crankcase to either the air manifold or the carburettor. Statistics about the current car population in Sydney and the anticipated future growth rate are presented, and an estimate is made of the future date (1998) when the volume of exhaust products in Sydney will be the same as that in Los Angeles in 1942, when conditions of smog were first experienced. (Author's abstract)

08663

Starkman, Ernest S.

CHEMICAL POLLUTION FROM TRANSPORTATION VEHICLES. Preprint, California Univ., Berkeley, Coll. of Engineering, 16p., 1967. (Presented at the 134th Annual Meeting, American Assoc. for the Advancement of Science, Interdisciplinary Symposia on Man and Transportation, New York, N. Y., Dec. 30, 1967.)

The gasoline engine will probably be the principal power plant for passenger cars for at least the next decade. Chemical pollutants discharged by the gasoline engine are now under partial control. Carbon monoxide and unburned hydrocarbons from 1968 model cars are approximately 30 percent of that from prior production. Further demonstrated reductions can reduce this number to less than 10 percent in a decade. Additionally, in ten years, oxides of nitrogen can be reduced to about 20 percent of existing levels. Theory shows that carbon monoxide, unburned hydrocarbons and oxides of nitrogen ultimately can be completely removed from gasoline engine exhaust. Present designs of gas turbines for aircraft and for future projected application to ground vehicles yield pollutant (except for smoke) at levels below that of the gasoline engine of a decade hence. It has also been shown possible to eliminate smoke as well as odor from the gas turbine. Thus with proper effort, it is feasible to effectively reduce pollution of the atmosphere due to transportation to an acceptable level, even if electrically or alternatively powered vehicles cannot be developed for a decade. (Author's summary, modified)

08735

Mourik, J. H. and C. Van

THE FORMATION OF NITROUS FUMES IN GAS FLAMES. Ann. Occupational Hyg. (Oxford), 10(4):305-315, Oct. 1967. 9 refs.

When a mixture of gas and air is burned, only small quantities of NO and NO2 are formed. If extra oxygen is supplied, the production of NO increases rapidly. The change/over from coke oven gas to natural gas in the Netherlands was accompanied by a considerable increase in the level of nitrous oxides in spaces where gas flames are used, especially in glass-blowing shops. Data on the burning of gas/air and gas/oxygen flames are tabulated. The main cause of NO production is linked to the different flame characteristic of natural gas so that one is inclined to add too much oxygen to a natural gas flame, leading to the production of N/ which far exceeds the permissable concentration. A better ventilatory or exhaust system is then needed. In practice, an Emergency Exposure Limit of 63 mg./cu m of NO2 for 5 minutes is recommended.

08802

Hoffmann, H.

THE COMPOSITION OF EXHAUST GASES FROM DIESEL MOTORS. ((Die Zusammensetzung der Auspuffgase bei Dieselmotoren.)) Text in German. Z. Praeventivmed. Vol. 11, p. 104-121, March-April 1966.

The smoke emission of different types of diesel motors was determined and the results presented in a series of graphs. Under full load little difference in smoke emission was observed between chambered engines and direct injection engines, while the latter were superior under partial load. The various factors in engine development which influence smoke emissions are discussed. The carbon monoxide, aldehyde, and nitrogen oxide content of the exhaust gas was determined and it was found that the CO content is of no concern in diesel motors, since the concentration is not over 0.1-0.15 Vol.% and in many cases below 0.05 Vol.%. The same is true for aldehydes whose odorous annoyance has a psychological but not medical effect at the emitted concentrations. The nitrogen oxide content was found to be higher with direct fuel injection engines. The amount of 3,4-benzopyrene emission is influenced by the fuel composition and the combustion system and is only of concern if the motor is operated under high mean pressure, when as much as 0.5 gamma benzopyrene in 500 liters of exhaust gas was found at 1200-1500 U/min. under 3/4 load. It is concluded that by proper construction and development and particularly by proper care of the engine, the smoke from modern diesel engines can be reduced to an unobjectionable amount.##

09026

Burckle, J. O., J. A. Dorsey, and B. T. Riley

THE EFFECTS OF THE OPERATING VARIABLES AND REFUSE TYPES ON THE EMISSIONS FROM A PILOT SCALE TRENCH INCINERATOR. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((28))p., 1968. 19 refs. (Presented at the National Incinerator Conference, New York, N. Y., May 5-8, 1968.)

This work defines the air pollutant emissions from a Trench Incinerator burning three types of refuse material: low ash, moderately high heat content materials characterized by cord wood; high ash, high heat content material characterized by rubber tires; high ash, low heat content material characterized by municipal refuse. Use of a trench incinerator for the disposal of the high ash content materials studied generated particulate emissions which, in all cases, exceeded 1 grain per standard cubic foot at 12 per cent carbon dioxide and is therefore not recommended. For disposal of low ash, high heat content materials, the data indicate that, except for nitrogen oxides, emission levels from the trench incinerator may be acceptable if rigid operating controls are predetermined for the specific refuse material. (Author's abstract)##

09028

G. G. Esposito

QUANTITATIVE MEASURE OF PHOTOCCHEMICALLY REACTIVE AROMATIC HYDROCARBONS IN ENAMELS AND THINNERS. (INTERIM REPORT.) Army Coating and Chemical Lab., Aberdeen Proving Ground, Md., Contract AMCMS-5025.11.29500, Proj. 1T024401A329, CCL-241, 12p., Dec. 1967. 5 refs. Alsc: J. Paint Technol., 40(520): 214-221, May 1968. 9 refs.
CFSTI, DDC: AD 663813

Recently enacted air pollution abatement laws regulate the amount of photochemically reactive solvents at can be used in paint products. Aromatic solvents possess the strongest solvency of the hydrocarbon types, but their use in paint must now be restricted in order to comply with air contamination laws. This report describes a suitable gas chromatographic procedure for the determination of toluene, ethyl benzene and total aromatics in enamels and thinners. The solvent is isolated by vacuum distillation. High boiling and low boiling internal standards are added and the analysis is conducted on six and eighteen foot columns containing N,N-Bis(2-cyanoethyl) formamide as the liquid. (Author's abstract)##

09216
Hess, W.

SURVEY OF AIR ANALYSES IN THE CITY OF ZURICH IN 1961-9165. ((Ubersicht uber die Luftuntersuchungen in der Stadt Zurich von 1961 vis 1965.)) Text in German. Z. Praeventivmed., 11(2):144-156, March -April, 1966. 5 refs.

Extensive measurements of CO and NO2 levels were made during 1961 - 1965 at several intersections and a tunnel in Zurich. COHb levels in the blood of traffic policemen were also measured and plotted against time; wind velocity and the number of vehicles passing the measuring points were noted. A check of diesel trucks showed that 15-20 percent had an excessive soot content in the exhaust gases. The SO2 level was strongly dependent on atmospheric humidity.

09323

T. A. Huls, H. A. Nickol

INFLUENCE OF ENGINE VARIABLES ON EXHAUST OXIDES OF NITROGEN CONCENTRATIONS FROM A MULTI-CYLINDER ENGINE. Preprint, Society of Automotive Engineers, 12., 1967. 12 refs. (Presented at the Mid-Year Meeting of the Society of Automotive Engineers, Chicago, Ill., May 15-19, 1967. Paper 670482.)

The influence of engine variables on the concentration of oxides of nitrogen present in the exhaust of a multicylinder engine was studied. The concentrations of nitric oxide (NO) were measured with either a mass spectrometer or a non-dispersive infrared analyzer. The CO concentration was low for rich operation (deficient in oxygen) and increased with air-fuel ratio to a peak value at ratios slightly leaner than stoichiometric proportions. A further increase in air-fuel ratio resulted in reduced NO concentrations. Advanced spark timing, decreased manifold vacuum, increased coolant temperature and combustion chamber deposit buildup were also found to increase exhaust NO concentration. These results support either directly or indirectly the hypothesis that exhaust NO concentration is primarily a result of the peak combustion gas temperature and the available oxygen. The NO concentration of the exhaust from an individual cylinder is a function of the air-fuel ratio of the charge that the individual cylinder receives. Since the NO concentration as a function of air-fuel ratio is highly non-linear, it was concluded that the NO concentration of the conglomerate exhaust is a function of distribution as well as overall air-fuel ratio. The NO concentration of the gases expelled from an engine cylinder varies with time. The last portion to be expelled is, at least under some operating conditions, lower in NO concentration than the average of the well mixed exhaust gas from that cylinder. These results can be explained by flame quenching resulting from the relatively cold combustion chamber walls. (Authors' Abstract) ##

09341

Oberdorfer, P. E.

THE DETERMINATION OF ALDEHYDES IN AUTOMOBILE EXHAUST GAS. Preprint, Society of Automotive Engineers, 10p., 1967. 14 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670123.)

A method for the sampling and determination of exhaust aldehydes and ketones is described. The procedure consists of absorbing and converting these compounds to the solid 2,4 di-nitrophenylhydrazone derivatives. Results are reported as total aldehydes and/or the derivatives separated into individual, identifiable components by chromatographic techniques. Exhaust emission data employing this procedure are presented for a limited number of vehicles with and without exhaust control systems. Total aldehyde levels (as formaldehyde) were found to range from about 20 to over several hundred parts per million depending on the mode of operation and the adjustment of such variables as air-fuel ratio, spark timing, and exhaust emission control devices. Effects of these variables on aldehyde emissions are discussed. The relationship of the chemical structure of inducted fuel to aldehyde emissions is also touched upon. The amount of individual aldehydes was found to be related to the parent fuel to a considerable extent for pure individual hydrocarbon fuels. This relationship is greatly diminished, however, within the design limitations of current full boiling practical gasolines. (Author's abstract)##

09355

Pahnke, Alden J. and Edward C. Squire

LEAD IN GASOLINE: NO EFFECT ON EXHAUST EMISSIONS FOUND IN 18-MONTH CONSUMER-CAR TEST. Oil Gas J., 64(50):106-110, Dec. 12, 1966.

Use of tetraethyl lead in gasoline does not significantly affect exhaust emission characteristics of vehicles driven by the motoring public. This is the conclusion reached after a test of leaded and unleaded gasoline in 122 privately owned and operated cars spanning a period of 18 months and covering a total of 2,500,000 miles. Carbon monoxide and hydrocarbon-emission levels of the cars operated on leaded gasoline were essentially equivalent to those of the cars driven on unleaded gasoline. Photochemical reactivity and nitrogen oxide levels for the two car groups were also equivalent, further demonstrating the absence of any effects of tetraethyl lead on vehicle emissions either positive or negative.##

09393

Hettche, O.

AIR POLLUTION IN LOCALITIES WITH HEAVY TRAFFIC IN

METROPOLITAN CITIES. ((Die Verunreinigung der Atmosphare an verkehrsreichen Punkten in Grossstadten.)) Text in German. Z. Praeventivmed. 11(2):122-133, March-April 1966. 27 refs.

Data on the variations in time of CO, SO2, NO, NO2, hydrocarbons, polycyclic hydrocarbons, lead compounds and dust in various European cities such as Stuttgarg, Frankfurt, Hamburg, Essen and London are discussed and compared with data from Los Angeles. In heavy traffic, concentrations of up to 20 mg. CO, 0.2 mg. NO, 0.1 mg. NO2, 0.05-0.4 mg SO2, 2-10 mg. hydrocarbons and 4 microgram of lead per cubic meter were found. Polycyclic hydrocarbons such as benzpyrene and coronene can be determined accurately only in tunnels by analysis of the intake air and the air in the tunnel. In Germany, more diesel engines are in operation than the 0.3 percent in Los Angeles. Diesels generate only about 1 percent CO but maintenance must be frequent and soot emission must be controlled. Two-cycle engines give a very low CO emission. Methods used in Germany for the determination of pollutants are outlined. Standardization of analytical methods is emphasized.

09715

Eyzat, Pierre and Jean-Claude Guibet

THEORETICAL AND EXPERIMENTAL STUDY OF THE FORMATION OF NITROGEN OXIDES IN INTERNAL COMBUSTION ENGINES. ((Etude theorique et experimentale de la formation des oxydes d'azote dans les moteurs a combustion interne.)) Text in French. Ingrs. Automobile (Paris, 41(2):91-102, Feb. 1968. 11 refs.

A mathematical mode of estimation is explained which allows one to determine in advance the levels of NO in automotive exhaust. An excellent correlation has been observed between the calculated and measured values. The levels of NO in the exhaust result from the creation of an equilibrium of the bimolecular system N2 and O2, which is principally controlled by temperature and the amount of free O2 present in the burning gas. This simulation program allows one to select, from a theoretical viewpoint, the optimal components of combustion with respect to the agreed production of NO. One can thus mathematically fix the products of slow and fast combustions.

09759

Sharpe, L. M.

ENERGY SOURCES AND POLICIES, THEIR IMPACT ON AIR POLLUTION, CURRENT AND PROJECTED. Public Health Service, Washington, D. C., Bureau of Disease Prevention and Environmental Control, Contract PH-86-67-69, ((227)) p., April 15, 1967. ((76)) refs.

There have been a number of energy studies over the last 15 - 20 years that have attempted to project the national energy needs to various dates in the future. This study compiles energy projections and the "mix" of energy sources to the year 2000, made

as recently as 1967, and, on the basis of these data: estimates the atmospheric pollution burden to be expected by the years 1980 and 2000 provided present fuel policies remain essentially unchanged; summarizes some of the major technological developments that could have an impact on energy source selection and total energy requirements; identifies and discusses some of the major government policies that affect both fuel source and energy demand; outlines some approaches to an evaluation on a benefit/cost basis of alternative policies that would reduce atmospheric pollution and completes the analysis for the solvent refined coal process.

09785

Dickinson, Janet, Robert L. Chass, and W. J. Hamming

AIR CONTAMINANTS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 11-21, 1967.
GPO: 806-614-30

The parameters of an air pollution problem, particularly the problem in Los Angeles County; the measures taken to eliminate the problem; and control measures still needed are described. The air contaminants include: organic gases (hydrocarbons, hydrocarbon derivatives); inorganic gases (NOx, SOx, CO); miscellaneous inorganic gases (NH3, H2S, Cl2, F2); particulates (carbon or soot particles, metallic oxides and salts, oily or tarry droplets, acid droplets, metallic fumes). Each is discussed indicating the sources and significance in the air pollution problem.

09830

Wetzley, Arthur B.

WIRE RECLAMATION. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 495-503, 1967.
GPO: 806-614-30

Scrap copper wire, with a diameter in the range 14 gage to one inch, which has combustible insulation is reclaimed by burning off the insulation in an incinerator. A great variety of materials composes the combustible insulation: Rubber, paper, cotton, silk, and plastics such as polyethylene and polyvinyl chloride. Moreover, the wire itself may have a baked-on coating of plastics, paint, or varnish. As received for burning, the total combustible content of the insulated wire may vary widely from several percent to over 50 percent by weight. Most commercial wire contains from 20 to 35 percent insulation. Burning in the open is accompanied by

copious quantities of dense smoke, disagreeable odors, inorganic materials, and oxygenated hydrocarbons. Burning in single-chamber incinerators produces somewhat less smoke, odors, and other air contaminants than open burning does, since combustion air can be regulated. The only practical industrial equipment available today for controlling emissions from single-chamber insulation-burning incinerators is an afterburner or secondary combustion chamber. The composition of stack gases from equipment with and without afterburners is presented. Design methods, materials of construction, and operating procedures are discussed and illustrated.

09831

Walsh, Robert T.

GASEOUS AND LIQUID FUELS. In: Air Pollution Egineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 507-514, 1967.
GPO: 806-614-30

The burning of gaseous and liquid fuels is so commonplace that it enters directly into a vast number of air-polluting processes. The burning of any fuel under less than optimum conditions produces some quantities of carbon, ash, and unburned and partially burned hydrocarbons. In addition, many fuels contain sulfur and metallic compounds that are, even in the oxidized state, air pollutants. Air contaminants generated from fuel burning fall into three categories: (1) Carbon and the unburned and partially oxidized organic materials that result from incomplete combustion, (2) sulfur oxides and ash directly attributable to fuel composition, and (3) oxides of nitrogen formed at firebox temperatures from oxygen and nitrogen of the air. Incomplete combustion products can usually be held to tolerable minimums with proper operation of modern burner equipment. Sulfur and ash emissions are governed by the fuel makeup. Nitrogen. Nitrogen oxide concentrations are primarily functions of firebox design and temperature. The causes of such phenomena as black smoke, white smoke, sulfur and nitrogen oxides, and particulate emissions are discussed. Compositions of common fuel gases, fuel oils, and their combustion products (both gaseous and solid) are tabulated. Sulfur removal from fuels and municipal regulations limiting sulfur compound emission and sulfur content in fuels are discussed. Combustion products of any given fuel may be determined by the method illustrated.

09833

Walsh, Robert T.

BOILERS, HEATERS, AND STEAM GENERATORS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and

ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 525-558, 1967.
GPO: 806-614-40

Boilers, heaters, and steam plants which burn fossil fuels (oil or gas) produce large quantities of particulates oxides of sulfur and nitrogen, and acid mist due to hydrolysis of SO3. Particulate emission during normal operation and tube cleaning is discussed. The formation, reactions, kinetics, and equilibria for NOx and SOx are presented which form the basis for recommendation on firebox temperatures, combustion oxygen concentrations, and burner design for optimum performance. Pollution control equipment, such as cyclones, filters, electrical precipitators, alkaline additives, metal oxide and carbon filled adsorbers, afterburners, and various scrubbers are described and evaluated. Experimental data is given for several methods of control. Lowering excess air, catalytic decomposition of NOx, reducing flame temperatures, and eliminating air preheat are also discussed. Consideration is given to the economics of emission control, especially SOx, and to thermal efficiency.

10135

Brubacher, Miles L. and Donel R. Olson

SMOG TUNE-UP FOR OLDER CARS. In: Vehicle Emissions, Part II SAE Progress in Technology Series, Vol. 12, New York Society of Automotive Engineers, Inc., 1966, p. 268-290. 20 refs. (Presented at the SAE Southern California Section, April 1964.)

Surveys of smog forming pollutants from the exhaust of the California car population have shown a tremendous range of emissions between the worst and the best cars. A study was conducted to determine the effectiveness and cost of various tune-up approaches to the auto exhaust emission problem. Four phases of tune-up were explored and pertinent facts and data are included in this paper. Three major engine systems affecting emissions of older cars are ignition, carburetion, and exhaust valve leaks. Exhaust control is predicted to be a $150,000,000 annual business and the incentive exists to develop more effective and cheaper control systems. The average annual tune-up cost was about $30. (Authors abstract, modified)

10388

M. Serruys, and G. Darrieus

THE COMPOSITION OF EXHAUST GASES FROM GASOLINE ENGINES. (Sur la composition des gaz d'echappement des moteurs a essence ((a pleine charge)), Text in French. Compt. Rend. (Paris), 264(15):1053-1055, April 10, 1967.

In a study of carburation and of fuel mixture loss after carburation, fuel was admitted into a 2,000 cps motor with four cyclinders of 1,100 ml. each and the amount of hexane produced by the combustion was noted. Graphed data indicates that hexane level increases with increasingly rich fuel mixtures. Hexane level also rises slightly when increasingly thin fuel mixtures are used. This data is incompatible with the thesis that a chemical equilibrium exists where the combustion temperature decreases with increasing leanness of the fuel mixture and increasing oxygen mixture. This incompatibility may be explained by the presence of incomplete combustion in the neighborhood of the cooler walls of the combustion chamber.##

10474L

Meldau, R.

EVOLUTION OF FUMES FROM STEEL BATHS AT HIGH TEMPERATURES. Stahl Eisen, 80(19):1288-1289, 1960. 11 refs. Translated from German. Henry Brutcher Technical Translations, Altadena, Calif., HB-4938, 9p., 1960. Available from Henry Brutcher Technical Translations, P.O Box 157, Alatadena, Calif. 91001

International literature on the causes of fume formation in various steelmaking processes is critically reviewed. Although the theories and mechanisms presented differ, most researchers agree tha fume development is somehow connected with carbon elimination. Oxygen- lance temperature is also suggested as a factor in smoke formation. In addition, the effects of CO, bubbles, alloying materials, and impurities on fume production are discussed.

10475

Sage, B. H.

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION. (SUMMARY REPORT.) California Inst. of Tech., Pasadena, Chemical Engineering Lab., 26 p., 1968. 3 refs.

A research program dealing with the influence of oscillatory combustion of various fuels on the residual quantities of nitrogen oxides and other partial oxidation products is summarized. Experiments were conducted at a pressure of 50 lb./sq. in. employing air and a range of fuels including natural gas, ethane, propane, and butane. The highest NOx levels occurred at near stoichiometric mixture levels, with a sharp decrease at richer mixtures, and a more gradual decrease at leaner mixtures. The budget of the program, along with a list of publications and reports and personnel requirements, is presented.

10639

Vengerskaya, Kh. Ya., G. N. Nazyrov, L. S. Bodrova, S. Ya. Dubrovskii, and V. P. Dumko

HYGIENIC ASSESSMENT OF NEW SYNTHETIC MATERIALS WHEN USE IN A HOT CLIMATE. ((Sanitarno-khimicheskaya otsenka primeneniya novykh sinteticheskikh materiolov v usloviyakh zharkogo klimata.) Hyg. + Sanit. (English translation of: Gigiena i Sanit.), 33(1-3):340 - 341, Jan.-March 1968. 3 refs.
CPSTI: TT 68-50449/1

When synthetic polymer materials are used in the construction of buildings in a hot climate, there is a potential hazard from entry of volatile substances into the air. Several synthetic materials used in interior decoration of premises in a building were studies. They were artificial chamais, a cotton fabric with a paste consisting of polyvinyl chloride resin and dibutyl phthalate; "Trimaza," a plastic material made of foamed rubber, which is coated with rubber latex adhesive and a layer of cut viscose fibers; emulsion paint, containing vinyl acetate, polyvinyl alcohol and butyl phthalate. The channel of the air conditioner was lined with "Mipor" (microporous rubber), which contained phenol - formaldehyde resin. Investigations showed that the synthetic materials used in the interior finish (chamais, "Trimaza," and emulsion paint) did not release volatiles. "Mipor" released carbon monoxide, carbon dioxide, and formaldehyde "Mipor" should not be used for the noise-proofing of air conditioners.

10649

Boubel, Richard W., Ellis F. Darley, and Edward A. Schuck

EMISSIONS FROM BURNING GRASS STUBBLE AND STRAW. Preprint, 23p., 1968. 5 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-28.)

The emissions from burning the residue following grass-seed harvest were determined by means of a combined laboratory-field study. Samples of the straw and stubble residue were burned in a laboratory burning tower. Complete analyses were determined for gaseous and particulate emissions from the important grass species from the Willamette Valley of Oregon. Particulate emissions averaged 15.6 pounds per ton of fuel burned. Carbon monoxide averaged 101 pounds per ton of fuel burned. Hydrocarbon emission averages, in pounds per ton of fuel burned, were 1.74 for saturates plus acetylene, 2.80 for olefins, and 1.68 for ethylene. The oxides of nitrogen expressed as NO2, at the temperature peak during the burn, averaged 29.3 ppm. Previous field studies measured only particulate emissions, carbon dioxide, and temperature over the burn. The carbon dioxide values were found to be similar to those obtained in the burning tower and it was

therefore assumed that the other gaseous emissions were similar and could be used for reasonably accurate emission inventories. The temperature values obtained in the laboratory and field were also similar and further justifies extrapolating the burning tower data to field situations. The particulate matter collected in the field studies averaged 15.6 pounds of particulate per ton of fuel burned. This is the same average obtained for the burning tower data. Much more variability was found in the particulate emissions obtained in the field which reflects the wider range of environmental conditions encountered in the field. (Authors' abstract, modified)##

10958

Brewer, A. W. and A. W. Wilson

THE REGIONS OF FORMATION OF ATMOSPHERIC OZONE. Quart. J. Roy. Meteorol. Soc., 94(401):249-265, July 1968.

The nature and magnitude of the source of the natural ozone of the atmosphere is discussed and the results of calculations of the local rates of production in the periods January-February and July-August are given. The effect of different assumptions and models on the deduced source regions and source strengths is demonstrated. It is concluded that the most satisfactory result is obtained using solar ultraviolet intensities recently measured in the stratosphere. It is possible that there may be some catalytic destruction of ozone by water vapour, but below 35 km the effect must be small. (Authors' summary)##

11008

Shah, I. S.

AIR POLLUTION. PULP PLANT POLLUTION CONTROL. Chem. Eng. Progr. 64(9):66-77, Sept. 1968.

In Kraft process, chemicals in the form of solids, mists, odorous and nonodorous gases are being emitted to the atmosphere. The source of emission, the theoretical explanation for the emissions, and the various processes and equipment used to reduce the chemical and heat losses are discussed in detail.##

11109

Cook, N. A.

ANALYSIS OF FUEL CELLS FOR VEHICULAR APPLICATIONS. Preprint, Society of Automotive Engineers, 23p., 1968. 8 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., (jan. 8-12, 1968. Paper 680082.)
Paper 680082.)

The recent increase in smog and other air pollution problems traceable to internal combustion engine exhausts have created public interest in the search for new power sources for automobiles. An old favorite, the electric car, has received renewed attention, but battery technology is unable to offer a power source for a vehicle that will meet contemporary consumer demands for speed, range, and acceleration. The fuel cell has emerged from the laboratories as a practical electrical power source with much promise for vehicular application. This paper presents the State-of-the-art of fuel cells as related to electric automobiles and discusses fuels and economics. (Author's abstract)

11263

Reamer, H. H., Joan Jacobs, and B. H. Sage

OSCILLATORY COMBUSTION AT ELEVATED PRESSURE. EFFECT OF FUEL. Preprint, California Inst. of Tech., Pasadena, Chemical Engineering Lab., ((29))p., ((1966)) 10 refs.

The effect of varying the fuel from natural gas to ethane, propane and n-butane upon oscillatory combustion in a cylindrical chamber 1 in. i.d. and approximately 24 in. in length was investigated experimentally. A significant effect upon the residual quantities of nitrogen and upon the double amplitude of the perturbation in normal stress was noted. Little, if any, effect upon the frequency of the longitudinal perturbations was experienced. The results are presented in tabular and graphical form. (Authors' abstract)##

11326

E.A. Shuck

AIR QUALITY IN THE STATE OF CALIFORNIA. Preprint, California Univ., Riverside, Air Pollution Research Center, 30p., 1968. 15 refs. (Presented at the 16th Meeting of the Detroit Analytical Chemistry Conference, Detroit, Mich., Sept. 1968.)

During the past 20 years the quantity of combustion emissions which are discarded into the air mass over California has been increasing at an alarming rate. These increases are the direct result of the population increase and the attending demands for power and products which are the ultimate source of most emissions. The daily tons of major emissions as reported on the county level are correlated to the undersirable aspects of air quality. Analysis of the reports from 14 counties indicates that California requires a substantial increase in awareness and effort on the county, regional, and state level in order to cope with the complexity of emission problems. Today the increases in emissions resulting from rapidly growing population are largely offsetting the decreases in emissions resulting from application of reductive control methods. The advantages to be gained by use

of atmospheric dilution and dispersion factors are being destroyed as a result of the growth and coalescing of cities. Many undesirable aspects of our air quality are caused by atmospheric interactions of the emissions of hydrocarbons and oxides of nitrogen. A very important source of these emissions in California is the automobile. However, if we overemphasize this point we are in danger of neglecting the 25-35% of these emissions which arise from other sources. Such neglect can only result in further deterioration of air quality.##

11603

Bush, A., J. Burke, R. Carlson, and S. Ross

EFFECT ON THE ATMOSPHERE WHEN AUTOMOTIVE EXHAUST EMISSIONS ARE CONTROLLED. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39, p. 39-59, Sept. 1968.

'Clean air' criteria were applied to investigate the atmospheric effects of exhausts from vehicles driven on different driving patterns (freeway, commuter, city driving) and the effects of different control devices on emissions during these driving cycles. A transparent polyethylene 6000-cu ft reaction chamber utilizing natural solar radiation and equipped with a filtration temperature, and humidity control systems was used as a miniature Los Angeles basin in which variables could be controlled and effects tested. To supply the exhaust, vehicles were run on a magnetic tape-controlled chassis dynamometer. Experimental results are given for new and older cars with respect to nitrogen oxides, carbon monoxide, ozone, and hydrocarbons. Results indicate that newer vehicles have not brought about an improvement in the condition of the atmosphere and have increased atmospheric NO levels. Control devices are designed to meet official tests, such as the 7-mode cycle, but meeting the test does not guarantee clean air. The Kopa recirculation device is under investigation and is being tested for effectiveness under all types of driving conditions.

11606

Robinson, L. B. and J. D. Pinkerton

COMBUSTION PROCESS ANALYSIS. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39, p. 81-90, Sept. 1968. 16 refs.

The formation of exhaust gas pollutants in the Otto cycle engine, and methods for predicting actual engine performance including friction, heat transfer, and irreversible chemical reactions, are under investigation. A comparison of nitric oxide emission levels calculated from kinetic data, with experimentally measured values reported by other investigators, indicates that current formation

mechanisms provide adequate explanation for the NO present in engine exhausts. Experiments are suggested to examine the validity of the theory that hydrocarbon exhaust emissions are formed in a quench zone next to the wall of the combustion chamber in Otto cycle engines. Despite the difficulty of calculating the hydrocarbon exhaust emission from an engine, current understanding of the hydrocarbon mechanism suggests that turbo-compounding an Otto cycle may prove a very effective way to maintain high thermal efficiencies while utilizing the low emission characteristic of low compression ratios. A literature review concerning engine friction is in progress.

11619

Auckland Air Pollution Research Committee, New Zealand

NINTH ANNUAL REPORT OF THE AUCKLAND AIR POLLUTION RESEARCH COMMITTEE FOR YEAR ENDING 31 MARCH 1968. 72p., 1968. 27 refs.

Data are presented pertaining to the pattern of fuel use, future sources of electrical energy, and meteorological conditions in the Auckland area. The relative importance of the different fuels used for domestic, commercial, industrial, and transportation purposes is considered, and an attempt is made to evaluate the probable rates of emission from their combustion. Seasonal and regional variations in the use of fuels are noted. In the case of domestic fuels, there are also daily variations. Maximum emissions of smoke and other pollutants from domestic sources occur during the early morning and late afternoon. These emissions often coincide with periods of little or no air movement. However, the use of coal, wood, coke, and briquettes is declining in the Auckland area and more reliance is being placed on cleaner methods of heating, such as electric heating appliances and oil-fired central heating units. Upward trends in the production of sulfur dioxide and nitrogen oxides may be offset to some extent by increasing electricity consumption. Sulfur dioxide levels could be reduced by fuel desulfurization processes. Another factor affecting Auckland's air pollution is the advent of natural gas. Increased usage of this fuel will assist in reducing levels of all pollutants.

11803

Fuller, Louis J., Ralph E. George, and John E. Williamson

SOME OBSERVATIONS ON AIR POLLUTION IN NEW YORK CITY: A REPORT TO THE MAYOR. Los Angeles County Air Pollution Control District, Calif., 30p., Jan. 17, 1966.

Air pollution in New York City has attained serious proportions as a result of the incineration of rubbish and garbage, combustion of fuels, motor vehicle emissions, and the growth of industries, both within the city and in adjacent areas. Precise

information on the quantities of pollutants emitted by each source are needed. However, incineration and fuel combustion are so serious that abatement measures cannot await further studies. Rapid and substantial improvements in rubbish and fuel combustion pollution should be achieved by applying known techniques. Rubbish disposal pollution can be relieved by substituting sanitary landfills for incineration; installing baghouse type control devices on municiple incinerators; replacing single-chamber and flue-fed incinerators with gas-fired multiple-chamber incinerators; and permitting the use of domestic garbage grinders. Fuel combustion pollution can be relieved by substituting natural gas for coal and oil; prohibiting the use of coal and grade No 6 residual fuel oil by Consolidated Edison; requiring the installation of two-stage combustion controls on the power company's fossil fuel-fired boilers; and prohibiting further installation of fossil-fired power plants in or near the city. Specific information must be obtained on the nature and quantity of pollutants from all sources. In addition, the behavior and motion of pollutants in the atmosphere must be determined. To accomplish these objectives, emission inventories and a comprehensive meteorological survey should be undertaken and a comprehensive air monitoring program instituted. (Author summary modified)

11828

D. R. Lamb, R. D. Shriner

PROCEEDINGS OF THE ROCKY MOUNTAIN REGIONAL CONFERENCE ON AIR POLLUTION (NOVEMBER 15-17, 1967.) Wyoming Univ., Laramie, Coll. of Commerce and Industry, 110p., 1967. ((140)) refs.

The purpose of the Conference was to bring together representatives of government, industry, and research for a meaningful discussion of air pollution and its causes, effects, and cures. The following topics were discussed: Industrial Gases, Particulates, Industrial Solid Waste Management, The Internal Combustion Engine and Smog, Banquet Session, Air Pollution Effects on Metecrology and Visibility, Air Pollution Effects on Humans, Air Pollution Effects on Animals, Air Pollution Effects Plants, Air Pollution Effects on Materials, Economics of Air Pollution, Air Pollution Control by Feed Lots, Air Pollution Control by Petroleum Plants, Air Pollution Control by Power Plants, Air Pollution Control by Wood Products Plants, and Air Pollution Control by Mineral Processing Plants.##

11835

K. T. Dishart, W. C. Harris

THE EFFECT OF GASOLINE HYDROCARBON COMPOSITION ON AUTOMOTIVE EXHAUST EMISSIONS. Proc. Am. Petrol. Inst., Sec. V., 48(No):612-642, 1968. 11 refs.

The exhaust emission characteristics of 15 gasolines covering the commercial range of low-high olefin and aromatic levels (5-20% and 10-35%, resp.) were compared in a variety of test vehicles (4 laboratory vehicles and 12 commercial automobiles). The premium-grade, leaded, test fuels all had similar octane and volatility characteristics and included 10 commercial gasolines and 5 special blends of refinery components. The test vehicles were equipped with various types of exhaust control systems (an air-injection system, a modified combustion system utilizing a lean mixture and modified timing, and the Du Pont experimental exhaust manifold reactor system). The exhaust was analyzed for CO, nitrogen oxides, and total hydrocarbons by conventional chemical methods. In addition, concentrations of individual hydrocarbons present in the exhaust were determined by gas chromatography and used to calculate the photochemical reactivity of the exhaust according to the scales proposed by Altshuller (USPHS), the State of California (MaGa), Glasson+Tuesday (GMC), Jackson (GMC), and Heuss+Glasson (GMC eye-irritation scale). Analysis revealed that gasoline hydrocarbon composition has no significant effect on either the chemical composition or the photochemical reactivity of the exhaust. The small effects of fuel aromatic content on photochemical reactivity and nitrogen oxide levels can be attributed to changes in fuel density affecting carburetor metering characteristics. Cars equipped with the Du Pont reactor produced exhaust with the lowest hydrocarbon, CO, NO and reactivity levels on all fuels. While the modified combustion system reduced the hydrocarbon and CO levels in the exhaust, it apparently resulted in higher NO levels.##

12011

Sweeney, M. P., G. C. Hass, J. N. Pattison, and F. Bonamassa

STATE OF CALIFORNIA MOTOR VEHICLE POLLUTION CONTROL BOARD: PROGRESS REPORT ON DYNAMOMETER CYCLE DEVELOPMENT WORK. In: Report on CRC Symposium on Exhaust Gas Analysis. Coordinating Research Council, Inc., New York, N. Y., CRC-RN-404, pp. 125-143, Sept. 21-22, 1965. 9 refs.

A study was undertaken with the purpose of designing a new street route and chassis dynamometer test cycle equivalent to each other and which represent peak morning smog driving in the central area of Los Angeles. The test route should be designed to be as free as possible of seasonal, traffic and driver variations, so that its off-peak driving simulates morning peak commute driving in the fall. A study of traffic surveys indicated that the heaviest traffic is centered in downtown Los Angeles, therefore, a six-mile radius was chosen for study. From city traffic counts which included peak counts, and a.m., p.m. peak hours, it appeared that the a.m. peak hour ends about 8:00 a.m. and the greatest traffic density appears to be in the downtown area. All traffic within the central six mile radius was classified according to the type of road and the direction of travel. An attempt was then made to determine the amount of traffic in each category for the morning peak hour. These data were converted to sample trips. Sample trip percentages were obtained for; freeways, arteries and capillaries. The requirements for a proper dynamometer cycle are outlined. The dynamometer cycle comparisons were not complete at this time.

12176

Landen, Ernest W.

NITROGEN OXIDES AND VARIABLES IN PRECOMBUSTION CHAMBER TYPE DIESEL ENGINES. Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1963. 8 refs. (Presented at the Soc. Automotive Engrs. International Summer Meeting, Montreal, Canada, June 10-14, 1963.)

Nitrogen oxides produced in the combustion of compression ignition engines are of some significance because they are quite reactive and can attack lubricating oils and engine parts. Measured amounts in the exhaust gases of diesel engines can be used to evaluate those factors in operation and design which are important in controlling the quantities produced. In the precombustion chamber type of diesel engine, the local peak combustion temperature influences the formation of nitrogen oxides. These localized peak temperatures are controlled by such factors as fuel-air ratio of combustion, duration of fuel injection, timing of fuel injection, inlet manifold air temperature, engine speed, and supercharging. Data presented indicate how these variables affect the formation of nitrogen oxides as measured in the exhaust gases. Higher inlet temperatures and more rapid mixing of the fuel and air than is used in today's precombustion chamber engines are conducive to the formation of larger quantities of nitrogen oxides.

12557

Wood, F. A.

SOURCES OF PLANT-PATHOGENIC AIR POLLUTANTS. Phytopathology, 58(8):1075-1084, Aug. 1968. 27 refs.

Sulfur dioxide, fluoride, ozone, and peroxyacetyl nitrate are currently the most important plant-pathogenic air pollutants in the USA. These or their precursors emanate from transportation, industry, or generation of electricity. The increase in population and in our demands for energy will result in increased activity within each of these categories and attendant increases in pollutant emissions. Thus, in all instances, the problem is going to worsen within the next 20 years. By 2000 AD or shortly thereafter, there should be a reduction in the levels of SO2 to present levels; the fluoride pollution problem will probably be worse; and, unless a power plant such as the electric engine is developed to take the place of the gasoline engine, our major problem will probably be one of photochemical air pollutants. It is also quite likely that pollutants such as hydrogen chloride and chlorine will increase in importance in the future. Finally, it should be kept in mind that the accuracy of predictions of this type is subject to changes in attitudes and technology. (Author's summary)##

12588

Eyzat, P. and J. C. Guibet

A NEW LOOK AT NITROGEN OXIDES FORMATION IN INTERNAL COMBUSTION ENGINES. Preprint, Society of Automotive Engineers, Inc., New York, 18p., 1968. 29 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1968, paper 680124.)

The theory presented allows forecasting of nitric oxide emissions in spark ignition engines. Following preliminary review of possibilities of obtaining the equilibrium state, as well as the basic concept of medium temperatures, the use of kinetic calculations for estimating the NO content of both unburned and burned mixtures is suggested. After good correlation is obtained, particularly for lean mixtures, the calculation is used to determine the best combustion process by simulation on a computer. Since experiments show an important effect of the fuel-air heterogeneity, complementary simulating work is conducted in order to define the best fuel stratification laws. (Author abstract modified)

12990

Gruson, G. and E. Hanke

PROBLEMS OF THE REMOVAL OF NITRIC OXIDE IN ELECTROSTATIC PRECIPITATORS. (Probleme der Stickoxidentfernung beim Elektrofilterbetrieb). Text in German. Freiberger Forschungsh. A, no. 413:37-73, 1967. 36 refs.

The problem of the nitric oxide formation in electrostatic precipitators was studied both by an extensive literature search and by experiments. It is well known that NO is involved in the precipitation of tars and rosins in electrostatic precipitators used in gas works. However, it is less known under what circumstances NO is produced or destroyed by the effect of high potentials. Nitric oxide measurement techniques and theoretical understanding of the processes are therefore of economic significance for gas works. After a discussion of the partially contradictory results reported in the literature, measurements in a gas and a coke plant are described which prove that electrostatic precipitators for tar increase the NO concentration and thereby the tar content of the gas. The Ilosvay method used for the NO measurements is described, as well as the preparation of NO samples for its calibration. In this method, the NO in the gas is first oxidized to NO2 by KMnO4. The NO2 is then scrubbed by the Ilosvay solution consisting of sulfanilic acid and alpha-naphthylamine. The reaction produces p-benzenesulfonic acid-azo-alpha-naphthylamine, which is measured photometrically. This method detects 50.0% = or - 1.2% of the NO. As results of experiments with electrostatic precipitators, the formation of NO as a function of the potential with various model gases is reported. At O2 concentrations between 0.4 and 1.5%, both NO and NO2 are formed at potentials up to 60 kV. In the presence of up to 8 g ammonia per cu m, only NO (up to 80 cu cm/cu m) was formed. The significance of these results, together with the research findings reported in the literature, is discussed.

13547

Spindt, R. S., Court L. Wolfe, and Donald R. Stevens

NITROGEN OXIDES, COMBUSTION, AND ENGINE DEPOSITS. J. Air Pollution Control Assoc., 6(3):127-133, Nov. 1956. (23) refs.

Experimental studies were conducted with single and multiple cylinder engines to determine how the concentration of nitrogen oxides in the exhaust gas varied with operating conditions. Chemical analysis of the exhaust gases verified theoretical conclusions that appreciable nitric oxide should be formed in the combustion process. It was found that nitric oxide always increases with increasing intake pressure, independently of any other fixed variable. In general, the effect of increasing speed is to reduce the amount of nitric oxide because of the decrease in reaction time. The amount of nitric oxide present is controlled by throttle settling and air-fuel ratio. The amount is low at full throttle, rich mixture conditions, but increases at part throttle due to leanness of the mixture. It is concluded that engines operating under normal spark timings with mixtures on the lean side of stoichiometric will produce appreciable nitric oxide, the amount formed depending on the load applied. There appears to be little hope of reducing nitrogen oxides by changes in engine conditions, since optimum economical operation seems to be in the range of high nitrogen fixation.

13628

Shibuya, Toshikazu

ENGINE PERFORMANCE SEEN FROM THE EXHAUST SMOKE DENSITY OF SINGLE CYLINDER DIESEL ENGINE. 2ND REPORT. DEPENDENCE OF AIR-FUEL RATIO AND PRODUCTS OF COMBUSTION ON THE EXHAUST SMOKE DENSITY. (Haikien nodo yori mita tanto diesel kikan seino. Dai 2 ho. (Haikien nodo to kuku-nenryo hi, oyobi haiki gasu sosei.) Text in Japanese. (Shiga Kenritsu Tanki Daigaku Gakujutsu Zasshi (Scientific Reports of Shiga Prefectural Junior College)), no. 8:1-5, March 1967. 12 refs.

Relationships among air-fuel ratio, smoke density and concentration of some components of exhaust gas from a single cylinder diesel engine running at low speeds were investigated with an air-fuel ratio meter and a gas detector. The measurement of exhaust smoke density vs. air-fuel ratio at 900, 800 and 750 RPM shows that, for each speed smoke density increases rapidly from relative minimum points. These minimum smoke densities are between 2.7 and 2.8 at air-fuel ratios of 26, 28 and 33:1 for 900, 800 and 750 RPM, respectively. Decreasing engine speed increases smoke density for any given air-fuel ratio. The results of the experiments on the effect of air-fuel ratio on CO, SO2, and NO2 emission showed that CO is minimum at an air-fuel ratio of about 26:1. It increases rapidly at lower ratios and at 22:1 reaches 0.01%, the so-called maximum permissible value for CO. Carbon monoxide concentration

exceeds 0.01% at light engine loads. Sulfur dioxide rapidly increases and exceeds 10 ppm (maximum permissible value) at air-fuel ratios lower than about 22:1. It decreases at higher ratios. Nitrogen dioxide concentration is minimum at an air-fuel ratio of about 23, increasing at both higher and lower ratios. Its concentration is always lower than 25 ppm, the maximum permissible value. It is proposed that an output at a smoke density of 2.7-2.8 or an air-fuel ratio of 26-27 be used as a normal output and an output at a smoke density of 3.3-3.4 or an air-fuel ratio of 22 be used as a maximum, when determining emissions from small diesel engines.

13698

Mohrnheim, Anton F.

AIR POLLUTION AND THE METAL FINISHING INDUSTRY. Plating, March 1969.

The role of nitrogen oxides in air pollution is discussed in order to inform those who work with nitric acid and aqua regia of their capacity for creating or preventing air pollution. Nitrogen dioxide itself is toxic and, in addition, contributes to chemical smog production through a photochemical chain reaction. Even though the metal manufacturing and finishing industry uses larger quantities of nitric acid than the precious metal industry, the latter may release comparable amounts of nitrogen dioxide. This is demonstrated by the quantititive reaction of gold and nitric acid. In the precious metal industry, closed systems should be used with only stoichiometric amounts of aqua regia. For pickling and similar work in the metal manufacturing and finishing industry, mist collectors or air scrubbers should be used.

13951

Sorenson, S. C. and H. K. Newhall

KINETICS OF HYDROCARBONS IN ENGINE EXHAUST SYSTEMS. Preprint, Combustion Inst., Central States Section 5p., 1968. (Presented at the Meeting of the Central States Section of the Combustion Inst., Columbus, Ohio, March 1968.)

Chemical reactions possibly occurring in engine exhaust systems are oxidation of hydrocarbons with an attendant reduction in emissions and modification of hydrocarbon structure giving rise to a change in photochemical reactivity or smog-forming potential of the exhaust products. This work consists of a theoretical estimation of the various hydrocarbon reactions which might be of importance. A mathematical model of an isothermal, well-mixed steady-flow system was used. Theoretical results indicate that pyrolysis and oxidation mechanisms may both be of importance in exhaust gas reactions, and that the hydrocarbons ultimately found in the exhaust gas may be

significantly different from the parent hydrocarbons. The results also indicate that the time required for complete oxidation is approximately 4 millisec at the high temperatures and free radical concentrations employed. These are extreme values and representative of only a completely insulated exhaust system. The oxidation process is accompanied by a large increase in the rate of energy release due to chemical reaction. Preceding oxidation, a large increase in the concentrations of free radicals and non-fuel hydrocarbons occurs. Significant pyrolysis products building up prior to oxidation include ethylene, acetylene, and methane. All of these are ultimately destroyed in the oxidation process, given sufficient time. (Author abstract modified)

14127

Stone, R. K. and B. H. Eccleston

VEHICLE EMISSIONS VS. FUEL COMPOSITION. Preprint, American Petroleum Institute, Montreal, Can., Div. of Refining, 50p., 1968. 9 refs. (Presented at the Session on Air and Water Conservation, 33rd Midyear Meeting of the American Petroleum Institute Division of Refining, Philadelphia, Pa., May 16, 1968, Preprint No. 43-68.)

Reduction of evaporation losses from motor vehicles was investigated as a means of lessening the amount of pollutants reaching the atmosphere. The effect of fuel volatility and of front-end fuel composition on the quantity, composition, and photochemical reactivity of vehicle emissions including both tailpipe and fuel-system losses were studied. In addition, the test variables included engine fuel-system features and ambient temperature, which was varied over a range of 20-95 F. Results of tests on eight 1966 model cars are given. Driving cycle and instrumentation typical of current practices for emission studies were used. Test results showed that at high ambient temperatures, a large reduction in evaporation losses accompanied a reduction in front-end fuel volatility. However, there was also a small adverse effect on exhaust emissions from volatility reduction. Reactive hydrocarbon emissions from evaporation were reduced substantially by either volatility reduction or saturation of light olefins. Light olefin reduction also reduced exhaust reactivity. Carbon monoxide emissions showed a small increase as fuel volatility was reduced, while nitrogen oxides and aldehydes showed no significant fuel effect. (Author abstract modified)

14895

Sallee, Elgin D.

FOUR TYPES OF AIR POLLUTION. Mod. Lithography, 36(9):79-81, 84, 87, Sept. 1968.

Air pollution emissions and control methods involved in the operation of coating ovens for metal decorating are reviewed.

Particulates or smoke from litho or coating oven exhaust stacks consist primarily of breakdown by-products of the resin or drying oil in the coating or ink during the bake. Several methods of reducing plume density are mentioned; it is noted, however, that these apply mainly to diluting stack gases and simply reducing their visibility, rather than to decreasing the absolute amount of emissions. Odorous pollutants are the most difficult to control; the bulk of the odors from coating ovens come from aldehydic and other resin-breakdown products that have very low odor thresholds despite their low concentrations in stack air, rather than from the more frequently blamed solvent vapors which have much higher concentrations but also higher thresholds. No one method of odor control has been found completely satisfactory, but the most success has been obtained by incinerating stack gases at 1300 F or more. Vapors of many of the solvents and thinners used in coating ovens are photochemically reactive and thus of major concern in areas where other conditions tend to promote smog formation. Because of stringent regulations in the Los Angeles area, all coating ovens must have solvent-elimination devices if the solvent amounts to more than 15 pounds per day. Some general discussion is given to the problems of applying various control methods to coating ovens, including high and low temperature incineration, catalytic oxidation, and scrubbing and adsorption systems.

14924

Sawyer, R. F., L. S. Caretto, and E. S. Starkman

THE FORMATION OF NITRIC OXIDE IN COMBUSTION PROCESSES. Preprint Abstract, Combustion Institute, Pittsburgh, 2p., 1968. 7 refs. (Presented at the Combustion Inst., Central States Sect., Tech. Meet. on Pollut. Problems Associated with Combust., Columbus Ohio, March 1968.)

Nitric oxide (NO) formation was investigated in several combustion environments including laboratory burner flames, stirred reactors, gas turbine combustor models, piston engines, and industrial and aircraft gas turbines. Hydrocarbon and ammonia fuels were studied with air as the oxidizer. Theoretical considerations were based upon both equilibrium and kinetic models in attempts to predict the composition of the combustion products for comparison with the experimental observations. Although the differences in the observed NO concentrations in different combustors seemed to emphasize the strong influence of combustor design, some trends were present which may be explained on the basis of theoretical arguments. From equilibrium composition calculations, the concentration of NO in combustion products was shown to be strongly dependent upon both the mixture ratio and product temperature, but not upon the combustion pressure. Kinetic processes prevent the equilibrium of NO concentrations in expansion of combustion products. Recent evidence indicates that NO formation is kinetically controlled in some combustion processes and that concentrations may fail to reach or, in some cases, even exceed equilibrium predictions. Studies of premixed ammonia oxygen flames in a porous plug burner reveal

NO at greater than predicted equilibrium concentrations. The singular role of nitrogen from ammonia in the formation of oxide is under current investigation. NO concentrations in a well-stirred reactor, ammonia combustion in a reciprocating engine, and NO infrared emission during the expansion process were recently measured. High NO levels were indicated. Measurement of nitric oxide from gas turbine combustors indicate that NO concentrations depend strongly upon the combustor configuration and even possibly upon the temperature-time history of the products in the turbine and exhaust systems. Studies of piston engine expansion processes show NO levels to be frozen early in the expansion process; concentrations are not simply related to the equilibrium levels predicted for peak cycle temperatures. (Author abstract modified)

15043

Los Angeles County Air Pollution Control District, Calif.

INITIAL BRIEF OF THE AIR POLLUTION CONTROL DISTRICT OF THE COUNTY OF LOS ANGELES. (Presented before the U. S. Federal Power Commission in the Matters of Transwestern Pipeline Co., Docket no. CP63-204, CP64-91; El Paso Natural Gas. Co., Docket no. CP64-76; Gulf Pacific Pipeline Co., Docket no. CP63-223. 46p., 1965.)

Evidence is presented indicating that fuel oil burning by industry and power plants is seriously affecting public health in Los Angeles and could lead to a major disaster. To combat this acute air pollution problem, industry and power plants must be provided with year-round natural gas service at higher levels than those of Pacific Lighting's Tailored Supply Program. Unless the power plants and industry can change to a cleaner fuel, sulfur dioxide and nitrogen oxide levels, which already exceed most modern recommended standards, will increase dramatically in the next 15 years. These pollutants in combination with sulfates and particulates are contributing causes of severe respiratory illness. Other air pollution problems wholly or partially attributable to fuel oil burning are damage to vegetation and property, reduced atmospheric visibility, and aggravation of photochemical smog. If natural gas were substituted for fuel oil, daily emission of nitrogen oxides could be reduced by 85 tons, sulfur dioxide by 410 tons, and particulates by 31 tons. The peak periods for these pollutants are December, January, and February, refuting the contention of oil and gas companies that pollution is not a problem in winter.

15310

Friedlander, S. K. and J. H. Seinfeld

A DYNAMIC MODEL OF PHOTOCHEMICAL SMOG. Environ. Sci. Technol., 3(11):1175-1181, Nov. 1969. 19 refs.

A simplified kinetic scheme is proposed as a dynamic model for photochemical smog reactions. Unlike previous diffusion models, which have been concerned with nonreacting pollutants, the formulation of this model takes into account both the chemical reaction and turbulent mixing aspects of the photochemical smog problem. In the first part of the paper, a simplified kinetic mechanism is presented for the formation of photochemical smog from nitric oxide and unburned hydrocarbons. In the second part, diffusion models based on the general equation of conservation of species are discussed. The model is a combination of the transport and chemical kinetic equations and predicts the behavior of a reacting pollutant cloud. The roles of sulfur oxides and aerosols are not considered. Calculations basedon the model lead to concentration dependence on time, similar in form to the experimental results for laboratory reaction chambers. The Lagrangian similarity hypothesis for the diffusion of nonreactive components is extended to reacting species to take into account the effect of atmospheric mixing. This leads to a set of ordinary differential equations for the reactive species of the type describing a chemical reactor of variable volume. As a preliminary example of the application of the model, a calculation was made for a single bimolecular reaction.

15351

Levy, Arthur, Salo F. Miller, and Francis Scofield

PHOTOCHEMICAL SMOG: AN APPRAISAL OF KETONE REACTIVITY. Am. Chem. Soc., Div. Org. Coatings Plastics Chem., Preprints, 29(2):427-440, 1969. 10 refs. (Presented at the 158th Meeting of the Am. Chem. Soc., Div. Organic Coatings and Plastics Chemistry, New York, Sept. 1969.)

The photochemical smog reactivity of ketones and the relationships between structure and reactivity among ketones were determined. Twelve ketones were injected into a reaction mixture in a smog chamber. It was concluded that all aliphatic straight chain and branched ketones are only mildly eye irritating. Within one standard deviation, all aliphatic ketones yield the same response time. Ketone-like materials such as mesityl oxide and isophorone are more eye irritating than other ketones. This was attributed to their unsaturated structures. The data showed that branched chain ketones are chemically more reactive than straight chain ketones. Branched chain ketones are only slightly more reactive than straight chain ketones with respect to photochemical smog products and eye irritation. Ozone production is also more pronounced in the photooxidation of branched chain ketones.

15352

Scofield, Francis

AIR POLLUTION FROM SOLVENTS. Am. Chem. Soc., Div. Org. Coatings Plastics Chem., Preprints, 29(2):393, 1969. (Presented at the

158th Meeting of the Am. Chem. Soc., Div. Organic Coatings and Plastics Chemistry, New York, Sept. 1969.)

The organics and plastics coatings industries are among the major contributors to photochemical smog. A significant contribution arises from the evaporation of organic solvents. The reactivity of solvents varies over a wide range and a substantial reduction in the amounts of reactive materials contributed by solvent evaporation may be achieved without a corresponding reduction of the total solvents. The only effective way to date of establishing the relative reactivity of these compounds is an empirical method which exposes a mixture of the solvent and nitrogen oxides to irradiation. A number of photochemical reactors of this type are in operation and many of them provide for the direct determination of eye irritation. It is very difficult to predict reactivity of individual solvents, and since there is a wide variety of reactions which may take place, all of which lead to eye irritation or other damaging products, even a high degree of reactivity is not necessarily an indication that a solvent is objectionable. An accepted order of reactivity by classes of compounds is that, in general, olefins are the most reactive and should be controlled at the lowest level. Aromatic compounds are less objectionable but still require control, while most oxygenated and aliphatic materials are relatively innocuous and under present conditions do not appear to require control. However, within each of these classes a wide range of reactivity can be encountered. More information in this area is necessary in order to guide the writing of future regulations and possibly the revision of current controls.

15452

Smith, Ralph I.

AIR-POLLUTION PROBLEMS OF THE PHOSPHATE INDUSTRY. (Bureau of Mines and Geology, Montana, Western Phosphate Region, Proc. Ind. Seminar West. Phosphate Reg., Butte, Mont., 1966, p. 46-48, June 1967. (Special Pub. 42).

Materials from the phosphate industry which contribute to air pollution are listed as follows: solids, such as natural dust and organic particles, industrial dusts such as carbon and fly ash from the combustion of fuels, and fine dusts; gases, such as sulfur dioxide and trioxide, hydrogen fluoride, silicon tetrafluoride, chlorine, hydrogen chloride, carbon monoxide and dioxide, nitrous and nitric oxide, ammonia, alcohols, and ozone; and water vapor and mists, which are liquid from condensation of water and acids on suitable nuclei. The noxious gases come from two sources in the phosphate industry: a wet process called denning, and from calcination processes. As the gases or smoke come out of the stack, they may either continue upward, spread out and diffuse, or an inversion or turbulence may cause a rapid downward trend a short distance from the stack. Smoke and fumes have both psychological effects (depression and general irritation) and physiological effects (the irritation of membranes

of the nose, throat, and lungs by the inhalation of gases; a toxic effect in the stomach of animals who eat contaminated vegetation). Methods for the removal of solids are listed as follows: a long flue equipped with baffles and settling chambers; a filtering system such as a bag house; and the cyclone. The most economical and effective way of removing noxious gases is by scrubbing. Sulfur gases may also be sent through a sulfuric acid plant. Fluorine gases may be removed by forcing the gases through a bed of limestone; the absorption causes a chemical reaction to take place, forming inert calcium fluoride. Other removal methods mentioned include the following; electrostatic precipitation; and sonic precipitation.

15625

Tokyo Metropolitan Government, Japan, Public Nuisance Control Div.

THE EMISSION SOURCES OF NITROGEN OXIDE AND CHROMIC ACID AND THEIR STANDARD CONTROL EQUIPMENTS. (Chisso sankabutsu oyobi kuromusan misuto no hasseigen to sono hyojun jogai setsubi ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 3(7): 411-419, July 15, 1967.

Nitrogen oxides are emitted by nitric acid plants, sulfuric acid plants, certain kinds of chemical reaction apparatus, and metal surface treating plants. The metals which are treated with nitric acid are copper, aluminum, nickel, iron, and so forth. The nitrogen oxides which are generated by the reaction of metal and nitric acid are nitrous oxide, nitric oxide, nitrogen dioxide, nitrous anhydride, nitrogen peroxide, and nitric anhydride, the primary air pollutants being nitric oxide, nitrogen dioxide, and nitrogen peroxide. Nitric oxide is slowly oxidized by oxygen in the air. Poisoning from nitric oxide only has not been reported, but it is said to change active hemoglobin into an inactive one. Nitrogen dioxide and peroxide have a stinging odor, lower the blood pressure, and paralyze the nerves. High concentration of nitrogen dioxide above 100 ppm could cause human death. The allowable concentration of nitrogen dioxide is 5 ppm. Nitrogen dioxide is easily absorbed by water and becomes nitric acid, but nitric oxide must be oxidized before washing with water. Since the reaction rate of nitric oxide is very slow, some catalysts such as activated coal must be used. Chromic acid is generated almost exclusively by a chromium plating process. Hydrogen and oxygen gas generated by electrolysis release chromic acid into air, mainly in the form of chromium trioxide which is poisonous and injures the kidneys. The allowable concentration is 0.1 mg/cu m. Chromic acid mist can be absorbed easily by washing with water. The results by the above methods are the following: nitric oxide was reduced from 70,000 ppm to 36 ppm; nitrogen dioxide, from 650,000 ppm to 70 ppm; and chromic acid mist, from 42.65 mg/cu m to 0.077 mg/cu m.

15723

Faingold, S. G., A. M. Stanetskaya, L. A. Tretyakova, and N. S. Kipot

CAUSES OF THE FORMATION OF NITRIC OXIDE IN THE CARBONIZATION OF COALS. Coke Chem. (USSR) (English translation from Russian of Koks i Khim.), no. 2:23-28, 1969. 10 refs.

While confirming that nitric oxide is an inevitable product of coal carbonization, previous research has not established the extent to which carbonization participates in nitric oxide content of coke oven gas or its relationship to the nitrogen content of coal. To resolve these questions, as well as determine the nitric oxide content of coke-oven gas during carbonization, various coal blends and different grades of coal were carbonized in a gas-tight oven chamber at a pressure of 600-800 mm water gauge. The evolution of nitric oxide followed the same pattern for all blends and coals: the content reached a peak at 200-399 C, the beginning of carbonization, and the peak lasted until 400 C. The quantity of nitric oxide evolved was unrelated to the nitrogen content of the blends and coals. For example, one blend contained 2.36% nitrogen, and the dynamic mean nitric oxide content of the coke-oven gas equalled 2.83-3.67 ppm or 0.96-1.10 ml/kg for the blend. The nitrogen content of the blends ranged from 1.5-2.36%. The nitrogen content of coals varied less and the volatile matter differed sharply, but nitric oxide formation was the same as for blends. It is concluded that nitric oxide is formed as a result of reactions involving the liberation of oxygen from the air, introduced with the blend or coal and the oxygen-nitrogen-containing compounds in the coal.

15769

Pursall, B. P.

POLLUTION IN ROAD TUNNELS. Consulting Eng., 33(8):57-58, Aug. 1969. 9 refs.

The sources and causes of the build-up of pollutants in road tunnels are discussed. The two main sources of poisonous exhaust gases are gasoline and diesel engines. Diesel exhaust emits a smaller percentage of carbon monoxide than the gasoline engine, but because the diesel engine is larger, it emits a larger volume. The diesel engine also produces more nitric oxide and nitrogen peroxide. Vehicles emit up to 50% more carbon monoxide on the up-gradient than on the level; on the down gradient, they emit 40% less. In calculations for two-way tunnels, an average figure for carbon monoxide emission can safely be taken. Tests showed that the amounts of carbon monoxide and other combustion products vary directly with speed. Differences in tunnel concentrations for the Sumner Tunnel in Boston and the Central Tunnel in London were attributed to different vehicle speeds and variations between British and American vehicles and fuels. The variations resulted in higher concentrations of lead and hydrocarbons in the Sumner Tunnel; carbon monoxide concentrations were similar for average daytime periods in both tunnels. The effects of carbon monoxide, nitrogen oxides, and lead compounds are briefly discussed. It was concluded that if the concentration of CO can be diluted to below 100 ppm, the concentration of nitrogen oxides and other gases should be relatively harmless.

Visibility should also be satisfactory under these conditions. In a 2 way tunnel, the maximum ventilation rate was calculated to be 200 cu ft/min/ft. With one way traffic, ventilation is induced from the portals by the moving vehicles, but additional artificial ventilation would be necessary when the traffic is stopped or moving slowly. In most large tunnels, alarms operate if the CO concentration exceeds 250 ppm.

16135

Hashimoto, Michio and Masahiro Fujiwara

EFFECTS OF AUTOMOBILE EXHAUST GAS EMISSION ON AIR POLLUTION. (Jidoshahaikigasu no taikicsen enc eikyc). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 23(11):1151-1163, 1969. 25 refs.

In 1968, automobile production in Japan was almost 4,100,000 cars, a million more than produced in West Germany, and second only to the United State's production of 11,000,000 cars in the same year. While the United States, West Germany, France, England, and Italy show no annual increase, automobile production in Japan is increasing at an annual rate of 25-30%. If this rate is maintained, the approximate annual output should match that of the United Stated by 1974. It is difficult to imagine the extent of pollution by automobile engine exhaust when automobile production in a country approximately the area of California approximates that of the United States. Based on the results of measurements in several cities, the following aspects of pollution by automobile exhaust are discussed in detail: carbon monoxide emissions; dust fall including lead and pyrene; photochemical contaminations; hydrocarbon emissions; and odors. The toxicity of air pollutants for humans and vegetation is also examined. Although work on carbon monoxide began late in Japan, air quality criteria are now being formulated with respect tc carbon monoxide. Air pollution from automobile exhaust is found to be increasing by approximately 10-15%. It is hoped that control policies will be in effect before automobile production reaches one car for every two individuals.

16263

Ludwig, John H.

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Preprint, Assistant Commissioner, Science and Technology, Washington, D. C. 64p., 1970. 27 refs.

The contribution of motor vehicle emissions to community-wide air pollution problems depends on several related factors: the extent of community, commercial, and industrial sources as compared to vehicle sources; the size of the community and the distribution of these sources; topographical and meteorological factors; and the degree of control exercised for sources. The

relative importance of motor vehicle emissions can be approached by evaluating specific effects, specific pollutants, and sources with respect to pollutant emissions of all types. Average emissions by sources are presented for Los Angeles County, Louisville, Detroit, and 11 Pennsylvania counties. Sources of gaseous emissions from motor vehicles are reviewed, as well as the sources of hydrocarbon and smoke emissions from diesels. California standards are reported for vehicle smoke and odor emissions, carbon monoxide, and nitrogen oxides levels. Also reported are 1970 Federal Standards for exhaust emissions from automobiles and light trucks. An attempt is made to assess specific hydrocarbon constitutents in gasoline engine exhaust, crank case ventilation, and evaporation losses, and diesel exhausts and their relationship to photochemical reactions occuring in the atmosphere. The need of continued laboratory research and detailed examination of exhausts produced by control devices is stressed.

16539

Sone, Akira

THE SITUATION AND CONTROL OF AUTOMOTIVE EXHAUST EMISSIONS IN THE MIDDLE CITY (II) IN SENDAI CITY. (Chutoshi ni okeru jidosha haikigasu to sono taisaku (II) Sendai shi ni okeru ichirei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(7):437-440, July 15, 1968.

Sendai city is a business and industrial center in northeastern Japan with a population of more than 500,000. The rate of increase of automobiles has nearly doubled since 1963, the total number in 1968 being 130,000. Present heavy traffic and automotive exhaust emissions are attributed to poor city and residential planning. Interstate highways run through the city and the total number of cars on the highways averages 13,000 per day. In a traffic survey conducted from 1961 to 1967, the average number of cars was found to be 1700 per hour. The increase in auto traffic has been accompanied by a proportional increase of CO, Pb, NO2, and dust fall. The effects of engine exhausts became apparent when the number of cars reached 2000 per hour. Carbon monoxide concentrations exceeded the emission standard of 5 ppm of Miyagi Prefecture. The maximum concentration was 31 ppm and the average, 8 to 13.5 ppm. The maximum Pb concentration was 4.26 gamma/cu m, far beyond the emission standard. Maximum dust fall was 6.8 mg/cu m, exceeding the emission standard of 2.0 mg/cu m. Before the survey, Sendai city was more concerned with industrial pollutants such as smoke and dust. The survey indicates that the effect of engine exhausts is more severe than that of industrial pollution.

16627

Eyzat, P. and J. C. Guibet

EXPERIMENTAL AND THEORETICAL STUDY ON THE FORMATION OF NITROGEN OXIDES IN ENGINES. (Etude experimentale et theorique de la

formation des oxydes d'azote dans les moteurs). Text in French. Rev. Inst. Franc. Petrole Ann. Combust. Liquides (Paris), 22(4):689-712, April 1967. 28 refs.

An experimental and theoretical study of the concentration of NO + NO2 yields (NOx) in the exhaust gas of two spark-ignition and two diesel-type internal-combustion engines of specified characteristics lead to a numerical method for its calculation under a large variety of operating conditions. (NOx) was measured with about 10% accuracy by a variant of the spectrocolorimetric azo-dye method varying the richness of the air-fuel mixture, the inlet pressure, the degree of advancement of ignition, the compression ratio, the speed of rotation, and, in the diesel-type only, the operation without or with the use of an antechamber. Curves illustrating the variation of (COx) with these parameters are shown in graphs. Chemical-equilibrium methods of analysis were inapplicable within the short combustion period in the combustion engine, for a theoretical interpretation of their data, thus the evolution of the process N2 + O2 yields 2NO was determined throughout that period. The propagation was determined within the combustion space of volume V of a reaction-front separating a region of volume Vf occupied by the fresh air-gas mixture from a region of volume VB equals V-VF occupied by the burnt mixture as determined by the richness of the fresh mixture; by the rate of formation of NO at any given NO-concentration, temperature and volume; by the time-variation of the cylinder volume V, via crankangle, connecting rod/crank length ratio, and rpm; and by that of the cylinder pressure P, by the thermostatic relations between volume, temperature and pressure of either mixture for small adiabatic changes of state considering either as an ideal gas (of different heat capacity), as well as the amount of heat released during this change. The set of known interrelations among these, and other, variables was programmed for numerical computation on computer of the variation of (NOx) in the exhaust gas with the richness of the air-gas mixture under different operating conditions, as well as of other functional relations of interest. The agreement between the calculated and measured values for the same conditions was satisfactory. The program for determining the operating conditions for which (NOx) is a minimum is under preparation.

16722

LaMantia, Charles R. and Edwin I. Field

TACKLING THE PROBLEM OF NITROGEN OXIDES. Power, 113(4):63-66, April 1969. 9 refs.

The National Air Pollution Control Administration (NAPCA), an agency of HEW, is now sponsoring a program to define sources, magnitude, and character of the nitrogen oxide problem, and to consider various methods for the control of NOx emissions from stationary sources. NOx emissions are objectionable because of the brownish color that nitrogen dioxide gives the atmosphere, and also because of their tendency to promote formation of the

photochemical smog generally associated with automobile exhaust, resulting in various eye-irritating compounds such as formaldehyde, acrolein, and peroxyacyl nitrates. The sources and emission factors of NOx and various approaches to control, destruction, or removal are discussed.

17171

Myers, Phillip S.

NATION'S COST/BENEFIT RATIO WEIGHS HEAVILY ON AUTO EMISSIONS. S. A.E. (Soc. Automot. Engrs.) J., 78(3):20-27, March 1970. 1 ref.

The urgency and size of the automotive air pollution problem, solutions to the problem, and effect of controls on the problem were discussed. Man-caused additions of pollutants to the atmosphere are large with respect to natural contributions for particulate matter and hydrocarbons. Man already produces almost all the carbon monoxide, 90% with autos. The only oxides of nitrogen that are significantly man-caused are nitric oxide and nitrogen dioxide. These two represent only a small fraction of the total nitrogen compounds. Sixty per cent of the pollution in the United States comes from automobiles alone. One obvious source is blowby past the rings. However, most cars are equipped with PCV valves which eliminate this source in well-maintained cars. The largest contributor is the exhaust, both in quantity and smog forming potential. Nitrogen oxide and carbon monoxide form in the bulk gases; hydrocarbons are formed in the quench zone. Nitrogen oxides are controlled by recycling the exhaust or by burning a mixture that is either quite rich or quite lean. A rich mixture is undesirable; it increases CO and unburned hydrocarbons. It is difficult to burn a mixture lean enough to decrease NO to the desired level. One combination would be to run rich, then destroy the HC and CO in the exhaust system. This plan could be expanded to include two-stage combustion, but at a sacrifice in fuel consumption. Other solutions were presented. It takes 3 to 5 yrs to place a technologically feasible control technique involving significant modifications into universal mass production. There is an additional time lag of 4 to 7 yrs to equip enough cars with the control device so that noticeable reductions occur. Ultimately, it will be simple economics: what is the cost/benefit ratio for further reductions compared to steam, turbines, stirling engines, batteries, and fuel cells.

17327

Kitagawa, Tetsuzo

CONTROL OF AIR POLLUTION CAUSED BY EXHAUST GAS OF AUTOMOBILES. (Jidosha haikigasu ni yoru taiki osen no boshi taisaku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(11):741-749, Dec. 15, 1966. 8 refs.

The most practical means to control automotive exhaust gas varies from country to country according to geographical and meteorological conditions. Attempts to compare the status of pollution from auto exhaust gas in Los Angeles, where air pollution is widely known as photochemical smog, with that of Japan should be rejected. Photochemical smog is endemic to Los Angeles, where a heavy layer of atmospheric temperature inversion is present 80% a year. The Los Angeles atmosphere is a chemically-oxidized atmosphere containing substantial amounts of nitrogen, oxides, ozone, ozonated olefins, and organic peroxide compounds in addition to compounds from partially-burned fuels and aerosols formed by polymerization. In Japan, air pollution caused partially by auto exhaust gas is conditioned by relatively shorter periods of temperature inversion, the constituents of which, for the most part, result from heat radiation from ground surfaces, (the so-called night temperature inversions). This is quite contrary to the vast expanse of polluted atmosphere in Los Angeles. The production of photochemical smog is closely related to nitrogen oxides and hydrocarbons. Air pollution by motor vehicles in Japan is strictly confined to carbon oxides alone which are measured in air space surrounding a highway only, in the horizontal range of less than 100 m and at a vertical height of about 10 m. It is concluded that carburetor controls are the most practical way to reduce emissions of carbon oxides in Japan.

17335

Lavoie, George A., John B. Heywood, and James C. Keck

EXPERIMENTAL AND THEORETICAL STUDY OF NITRIC OXIDE FORMATION IN INTERNAL COMBUSTION ENGINES. Combust. Sci. Technol., 1(4) 313-326, Feb. 1970. 15 refs.

The nonequilibrium formation of nitric oxide within the internal combustion engine cylinder was examined. A thermodynamic model which predicts the properties of the burnt and unburnt gases during the combustion process was developed. A set of reactions which govern the formation of nitric oxide was proposed, and rate equations for nitric oxide concentrations as a function of time in the post-flame gases were derived. The results of time-resolved measurements carried out on a CFR engine were described, where emitted light intensities at wavelengths selected to record radiation from the CO + O and NO + O continua were used to determine the nitric oxide concentration. Results showed that both the formation and decomposition of nitric oxide in the post-flame gases are rate limited at the conditions under which internal combustion engines normally operate. In the lean case, the nitric oxide formed in the flame front is negligible. The state of the burned gas is not uniform. A substantial temperature gradient and nitric oxide concentration gradient exists behind the flame zone. The comparisons between theoretical and experimental results for fuel-lean mixtures confirmed that the important features of the model were correct.

17339

Dimitriades, Basil, B. H. Eccleston, and R. W. Hurn

AN EVALUATION OF THE FUEL FACTOR THROUGH DIRECT MEASUREMENT OF PHOTOCHEMICAL REACTIVITY OF EMISSIONS. J. Air Pollution Control Assoc., 20(3):156-160, March 1970. 11 refs.

Photochemical reactivities of vehicular emissions are reliably measured in laboratory experiments in which smog manifestations are observed directly. Results of the direct smog-chamber measurements revealed that the photochemical behavior of emissions may differ significantly from the behavior that is predicated from the exhaust composition using reactivity scales. The concept of direct measurement of reactivity was applied to determine differences in characteristics of emissions from 20 passenger vehicles, each tested using 10 different fuels. The primary objective of the fuel study was to assess the over-all effect on vehicle emissions of fuel modifications designed to reduce the photochemical pollution associated with automotive evaporative losses. A similar, brief, comparative study of leaded and nonleaded fuels was also made. Reducing volatility was found to reduce the over-all smog potential of vehicle emissions but involved some penalty by way of increased exhaust emissions. Replacing light olefin with the corresponding paraffin also reduced over-all smog potential and in this case exhaust reactivity was not affected. In general greater smog potential was found to be associated with prototype nonleaded fuels than with leaded fuels typical of products currently marketed. (Author abstract modified)

17357

Chovin, Paul

CHEMICAL POLLUTION OF THE ATMOSPHERE. (La pollution chimique de l'atmosphere). Text in French. Sci. Progr. Decour., no. 3417; 35-40, Jan. 1970. 6 refs.

A systematic general review is presented of the origin and nature of chemical pollutants of the atmosphere, of their action on living beings, and of the battle against atmospheric pollution. Principle sources of pollutants are the industrial and domestic heating plants. In regions of high industry concentration, steel plants and chemical plants emit specific pollutants. Principal pollutants are sulfur dioxide, sulfur trioxide, carbon dioxide, carbon monoxide, nitric oxide, nitrogen dioxide, fluorine, and light and heavy hydrocarbons. Sulfur dioxide is a byproduct of combustion of fossil fuels containing, on the average, 3% S (coal in France has about 1% S, some foreign coals have up to 6% S). Estimated emission of S is as follows: in France, 2 million tons, in England, 5 million tons, and in the U. S., 40 million tons a S per year. Sulfur trioxide is largely due to oxidation of SO2; it combines with moisture to form H2SO4 which is very noxious. Rain has a beneficial effect by scrubbing the polluted air. Carbon dioxide is the product of complete combustion of C;

500 to 600 million tons are estimated to be emitted in England. Carbon monoxide is the product of incomplete combustion, rather rare in industry, but invariably present in automobile exhaust gas. Nitric oxide and NO2 are present in low concentrations, but a complex photochemical reaction produces one type of smog, ozone, and new chemical compounds such as peracetylnitrate, CH3-CO-OO-NO2, which has a very strong physiological effect. Fluorine and its compounds, such as HF, are emitted by fertilizer and by aluminum plants. Dusts are emitted by industrial and domestic heating plants. The action of air pollutants on bronchi and lungs is disucssed at length. The reaction of the cardio-vascular system and the incidence of broncho-pulmonary cancer are also considered. In the battle against atmospheric pollution laws alone are insufficient, means of measuring emissions, and enforcing compliance are essential.

17365

Ellen, Richard P.

OUR AUTOMOBILE: A CONTRIBUTION TO AIR POLLUTION. Air Pollution Control Assoc, Pittsburgh, Proc. Air Pollution Control Assoc. Mid-Atlantic States Sect., Semi-Annu. Tech. Conf., Philadelphia, Pa., 1969, p. 44-54. 24 refs. (March 21.)

The harmful effects of pollutants on human health and current concepts of automotive emission control are considered. Systems to reduce engine exhausts, carburetor, and fuel tank emissions are reviewed. Attention is also called to the ability of fuel injection engines to cut hydrocarbon and carbon monoxide emissions in half and to the use of alternate fuels as a possible remedy for the exhaust emission problem. Federal and California emission standards for automobiles are compared. Human health responses are considered with respect to the following pollutants: carbon monoxide, nitrogen oxides, oxidants, and lead compounds.

C. ATMOSPHERIC INTERACTION

00070

G.B. Bell

METEOROLOGICAL CONDITIONS DURING OXIDANT EPISODES IN COASTAL SAN DIEGO COUNTY IN OCTOBER AND NOVEMBER, 1959. California Dept. of Public Health, Berkeley, May 23, 1960. 22 pp.

Evaluation of regional and local air circulation patterns, temperature inversion conditions and marine air stability over coastal waters, as well as the estimation of wind trajectories for air parcels present in Oceanside and San Diego at the time peak oxidant concentrations occurred, has resulted in the following conclusions: (1) A large-scale barometric pressure pattern affecting the western states region occurred prior to and during the San Diego County oxidant episodes in October and November, 1959; (2) This pressure pattern, which is believed to occur principally during the fall season, is characterized by the presence of a large high-pressure circulation over the Great Plateau states with an extensive trough of low pressure extending northwestward along the California coast from a low-pressure area over western Mexico; (3) The above pressure pattern is associated with extensive landbreeze development during the night in the Los Angeles and Santa Ana River basins, a condition which favors movement of surface air toward coastal water areas; (4) The high oxidant concentrations recorded in coastal San Diego County on October 14 and November 20, 1959, occurred several hours after onset of the sea breeze, indicating that the oxidant-laden air was brought from the seaward area; (5) During the over-water transit, air parcels containing oxidant-producing reactants were embedded in a shallow, stable marine air layer characterized by low-speed air circulation, and dispersion of the reactants was minimized; and (6) The two high oxidant episodes and the associated wind-transport mechanisms considered in this study usually occur infrequently during the fall season.##

00086

I. Elterman

ATMOSPHERIC ATTENUATION MODEL, 1964, IN THE ULTRAVIOLET VISIBLE, AND INFRARED REGIONS FOR ALTITUDES TO 50 KM. Air Force Cambridge Research Labs., Bedford, Mass., Office of Aerospace Research, AFCRL-64-740, ERP-46, Sept. 1964. 48 pp. CFSTI, DDC: AD 607859

A model of a clear standard atmosphere, for determining attenuation in the ultraviolet, the visible, and the infrared windows, is derived. The derivation is based on a Rayleigh atmosphere combined with aerosol and ozone components. The format of thre model is a series of tabulations for 22 wavelengths with Rayleigh, aerosol, and ozone components arrayed at kilometer intervals to an altitude of 50 kilometers. Exploratory calculations pertaining to horizontal, vertical, and slant-path transmission from sea level, transmission between two altitudes and transmission to space are readily made from the tabulations. Because of its more extensive coverage and improved computational programming, this report, including the tabulations, fully replaces the earlier publication, "A Model of a Clear Standard Atmosphre for Attenuation in the Visible Region and Infrared Windows." (Author)##

CC089

J.A. Curcio L.F. Drummeter, Jr.

EXPERIMENTAL OBSERVATIONS OF FORWARD SCATTERING OF LIGHT IN THE LOWER ATMOSPHERE. Naval Research Lab., Washington, D.C., NRL 6152. Sept. 30, 1964. 41 pp.
CFSTI, DDC: AD 607487

This report deals in part with the experimental results from seven measurements on the forward scattering of light by the atmospheric aerosol. Partial results follow: 1. Light scattered forward from a 50,000-w omnidirectional light source, when viewed from a point 45 km away below the horizon, was distributed on the horizon, was distributed on the horizon in a field 5 degrees high and 10 degrees wide. 2. Light scattered forward from a 10,000-w collimated carbon-arc light source which had a 1/2-degree beamwidth, was directed tangentially, and was observed from a point 45 km below the horizon was distributed on the horizon in a field 5 degrees by 10 degrees. 3. Airborne observations of forward scattered light from a searchlight beam 1/2 degree wide yielded on on-axis irradiance, at a range of 35 km from a horizontally pointed source, 550 times the irradiance at a point 115 meters above the geometrical edge of the beam. 4. Ground-based comparison of direct-line-of-sight irradiance and small-angle forward-scattered-light irradiance showed that in the wavelength interval 7500A to 9500A the direct light was 200 times the scattered light at a distance of 45 km when the meteorological range was 40 km. 5. Ruby laser light was transmitted at night over the horizon to a distance of 45 km when both receiver and projector were 6 ft above water and were pointed at one another with 0-degree elevation. The laser output was 0.10 joule and the signal-to-noise ratio in the system was 45. It is estimated that the surface transmission of the 45-km path at 6943A was about 0.00001.##

00095

F.N. Frenkiel

ATMOSPHERIC DIFFUSION IN AIR-POLLUTION STUDIES. David Taylor

Model Basin, Washington, D.C., Applied Mathematics Laboratory. (Report 1418.) (Reprinted from Proceedings of the Seventh Hydraulics Conference, June 16-18, 1958.) May 1960 22 pp.
CFSTI, DDC: AD 436249

This report discusses studies in which an urban area is represented by a mathematical model. Such a model takes into account the general meteorolcgical and topographical conditions as well as the distribution and nature of the pollution sources. The mean concentration patterns are then forecast for the mathematical model of the area. Although Los Angeles County is used as an example, the results refer to a mathematical model rather than to the exact physical situation in Los Angeles. The purpose of the discussion is to describe a mathematical method rather than a specific application.##

00102

H. W. Brandli

ATMOSPHERIC POLLUTION BY OZONE: ITS EFFECTS AND VARIABILITY (MASTER'S THESIS). (Submitted for the Degree of Master of Science at the Massachusetts Inst. of Tech.) May 1, 1965. 79 pp.

Surface ozone concentrations were measured in the Boston-Cambridge complex for the months of November and December, 1964 and January, 1965. The instrumentation used was a Mast ozone meter and recorder; a chromium trioxide filter was fitted to the air inlet of the meter to remove negatively interfering sulphur dioxide. The effectiveness of this filter was remarkably apparent in that removal of the filter caused ozone reductions of 50-100%. The overall range of ozone levels for the 3 months was 0.1 to 6.4 pphmv (part per hundred million by volume), well below toxic limits discussed in detail in this thesis. The average values for each of the 3 months indicate a possible correlation with the total ozone trend. Variation of the daily values is discussed with some meteorological factors as well as source strength. Seven simultaneous measurements of some of the halogens, obtained from a separate study by a colleague, are related to ozone concentrations. (Author's abstract)##

00130

AIR POLLUTION AND HEALTH. Am. Rev. Respirat. Diseases 93, (2) 1-12, Feb. 1966. (A statement by the American Thoracic Society Committee on Air Pollution).

The health hazards of air pollution are discussed in connection with the meteorological conditicns that help to bring them about, techniques of air pollution measurement, and research on the biologic effects of exposure tc air pollutants.##

00139

F. R. Allen and R. D. Cadle

A STUDY OF THE EFFECT OF MOLECULAR OXYGEN ON ATOMIC OXYGEN-HYDROCARBON REACTIONS. Photochem. Photobiol. 4, 979-87, 1965.

Investigations of the systems atomic oxygen-methane and atomic oxygen-n-butane have been made, using techniques for producing atomic oxygen in the presence and absence of ground state molecular oxygen. The results indicated that the initial rate of removal of atomic oxygen from both systems was accelerated by the presence of molecular oxygen, whereas the initial rate of removal of hydrocarbon, for n-butane, was affected little if at all.##

00177

H. Buchberg, M. H. Jones, K. G. Lindh, and K. W. Wilson

AIR POLLUTION STUDIES WITH SIMULATED ATMOSPHERES. California Univ., Los Angeles, Dept. of Engineering. (Rept. No. 61-44.) July 1961. 185 pp.

Part I of this report deals with the statistical relations among interacting atmospheric variables. Also contained in this report are the results of several auxiliary or supporting studies as follows: Air Purification Studies; Development of an Eye Mask for the Measurement of the Threshold of Eye Irritation; Development of an Omnidirectional Solar Radiometer for a Limited Spectral Region Centered about 0.36 microns; A Comparison of Concentration and Duration as Measures of Threshold for Eye Irritation; A Comparison of Threshold to Eye Irritation Resulting from Reacted Air Mixtures Sampled at Different Points in the Exposure System; A Comparison of Odor Threshold and Eye Irritation Threshold for Formaldehyde, Acrolein, and Ozone. (Author)##

00191

R. A. McCormick and K. R. Kurfis

VERTICAL DIFFUSION OF AEROSOLS OVER A CITY. Quart. J. Roy. Meteorol. Soc. (London) 92, (393) 392-6, July 1966.

Vertical exchange coefficients for aerosol material, K sub A, were determined from measurement of atmospheric turbidity at lambda = 0.5 micron following the motion of air flowing over Cincinnati, Ohio. Values of the coefficient for sensible heat, K sub H, were also obtained at the same time in some instances.

Most of the values of K sub A were in the range 10,000 to 1,000,000 sq cm per sec with a marked seasonal variation of the average values. No significant variation of K sub A with height (100 to 600 m) was found. (Author)##

00226

K. Koenuma

ON THE STABILITY AND VARIATION OF FOG PARTICLES.
Geophysics, Vol. 23, 373-377, 1952.

Condensation in the atmosphere takes place on some hygroscopic substances which suspend in the atmosphere in abundant number and absorb the water vapour even below 100% of relative humidity. These hygroscopic substances may be considered to be NaCl, MgC12, SO3 and etc., though details are not yet known. Such being the case, fog particles may be thought to be aqueous solutions of these salts whose saturation vapour pressure at a given temperature is lower than that of pure water and depends on the concentration of the solution. It has been frequently observed that relative humidity in the foggy air mass is below 100%. This may be explained by considering that the fog particles are aqueous solutions of some salts. In this paper, considering fog particles to be aqueous solutions of some salts, the stability and the variation of magnitude of a fog particle are discussed. For the complete discussion of this problem, the electric charge of fog particle must naturally be considered, but it may be left for the future. (Author's abstract)##

00236

H. Neuberger

CONDENSATION NUCLEI - THEIR SIGNIFICANCE IN ATMOSPHERIC POLLUTION. Mech. Eng. 70, 221-5, Mar. 1948. (Presented at a Joint Fuels Conference of the American Inst. of Mining and Metallurgical Engineers and The American Society of Mechanical Engineers, Cincinnati, Ohio, Oct. 20-22, 1947.)

Author discusses the constituents of the atmosphere and refers to the suspensions in the atmosphere as "aerosols". Explanations of dust and condensation nuclei including their chemical and physical nature are included. Also included is a section on the sources of nuclei as well as biological effects of aerosols. Charts include: Sulphur content of air and average number of nuclei in representative cities; Average ultraviolet radiation and number of condensation nuclei for clear skies; Average number of condensation nuclei per cubic millimeter for clear and cloudy skies; Mean number of condensation nuclei for various ranges of dust concentration in city air; and Retention of condensation nuclei in human respiratory system for various concentrations of nuclei in air.##

00242

W.W. Heck, C.S. Brandt, J.A. Dunning, F.L. Fox

ECOLOGICAL FACTORS INFLUENCING PLANTS AS MONITORS OF PHOTOCHEMICAL AIR POLLUTION. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-48.)

The response of plant systems to the oxidant complex of the air must be interpreted in terms of the influence of the total environment. Photoperiod, light intensity, carbon dioxide concentration, soil conditions, time of day, plant age, and frequency of exposures affect the response of pinto bean and tobacco to ozone. Tobacco is suggested as a relatively simple monitoring system for obtaining some data on photochemical pollution. (Authors' abstract)##

00245

P.R. Miller

THE RELATIONSHIP OF OZONE TO SUPPRESSION OF PHOTOSYNTHESIS AND TO THE CAUSE OF THE CHLOROTIC DECLINE OF PONDEROSA PINE (DOCTOR'S THESIS). (For the degree of Doctor of Philosophy in the Dept. of Plant Pathology, California Univ., Berkeley.) 1965. 135 pp.

The possible causes of a chlorotic decline and death of ponderosa pine in the San Bernardino mountains of southern California have been investigated. Fungi, bacteria, viruses, insects, nutrient deficiency or toxic mineral excess, mechanical damage to roots and drought have been considered and rejected as possible causal agents. Photochemical air pollution (smog) has been confirmed to be commonly present in the forest area both by photographic record and ambient air analysis. Ozone, a principal phytotoxicant in smog, caused an intensification of the typical chlorotic mottle needle symptom and loss of chlorophyll when enclosed portions of trees were fumigated in the field. The needle appearance improved and the chlorophyll content increased when similar enclosed branches were maintained in filtered air. Enclosed branches treated with ambient air also exhibited intensification of symptoms and loss of chlorophyll relative to unenclosed branches used as a control. There is adequate evidence to conclude that photochemical smog, principally ozone, is the primary cause of the chlorotic decline of ponderosa pine. The loss of chlorophyll or associated factor(s) due to ozone damage to leaf tissue suppresses photosynthesis which results in less stored food available for growth of roots and shoots, and for other energy requiring processes essential to life. (Author's abstract)##

00285

V. H. Regener

ATMOSPHERIC OZONE (CHAPTER VIII). Proc. First Intern. Symposium of Physics and Medicine of the Upper Atmosphere, San Antonio, Tex., 1951. pp. 109-122. 1952.

Author discusses the physical characteristics of the atmosphere in relation to the ozone content. There is a general discussion of 'atmospheric ozone' and subsequent portions of the article discuss the following: Total amount of atmospheric ozone; The vertical distribution of ozone; Absorption of ultraviolet sunlight by ozone; Toxic and chemical effects of atmospheric ozone; and Transport of ozone between stratosphere and troposphere.##

00302

A. P. Altshuller

ATMOSPHERIC REACTION STUDIES RELATED TO AIR POLLUTION. Arch. Environ. Health 8, 27-30, Jan. 1964.

Studies of air pollution in urban and adjacent rural areas by particles and trace gases need to be related to studies of composition of the earth's atmosphere. Man's activities generate pollutants which in themselves or through photochemical reactions contaminate the general atmosphere. Cooperative efforts need to be made by air pollution and atmospheric science laboratories to obtain monitoring data. Areas of such research in measurement of pollutants and nonpollutants, measurement methods, instrumentation, and biological and chemical effects are reviewed by the author. The proper selection of synthetic atmospheres for laboratory studies so that real conditions are reflected is emphasized. An important problem still requiring solution is the obtaining of support, personnel, and facilities for research and development on instrumentation for specialized applications.##

00344

W. I. Faith

RELATIVE REACTIVITY OF HYDROCARBONS IN PHOTOCHEMICAL SMOG FORMATION AND ITS PRACTICAL IMPLICATIONS. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-40.)

Adequate and intelligent control of photochemical smog requires a knowledge of the relative reactivity of the hydrocarbons emitted

from motor vehicles and a method of measuring them. An extensive survey of the literature yields the following general classification of hydrocarbons: (1) reactive (all olefins and all aromatics except benzene and toluene) and (2) nonreactive (all paraffins, acetylene, benzene and toluene). Within the olefin series, there is a wide range of reactivity; ethylene is far less reactive than other olefin species. In fact, ethylene provides a good line of demarcation between reactive and unreactive compounds, so far as photochemical smog formation is concerned. A simple method of analysis that will distinguish between reactive and non-reactive hydrocarbons is sorely needed. At present, an instrument that would distinguish between olefins and nonolefins would be useful. (Author)##

00345

J. C. Romanovsky, R. M. Ingels, and R. J. Gordon

ESTIMATION OF SMOG EFFECTS IN THE HYDROCARBON-NITRIC OXIDE SYSTEM. Preprint. (Presented at the Air Pollution Control Assoc. Annual Meeting, June 20-24, 1966, San Francisco, Calif., Paper No. 66-42).

The complex role of nitric oxide in photochemical smog has led to conflicting conclusions concerning its relationship to end effects. The confusion has not been dispelled by the tendency to employ kinetic parameters of the photochemical reactions accompanying the formation of smog as indicators of the end effects. In an attempt to resolve these differences a detailed study was carried out to examine the effects of varying the concentrations and reactant ratios of NO and "hydrocarbon" on a number of smog effects as well as on various functions of the reaction rate. Hydrocarbon components increasing in complexity from propylene through a simulated auto exhaust to authentic auto exhaust were irradiated in the presence of NO in large chambers instrumented for measurements of numerous variables. Eye irritation was measured using a selected panel of human subjects; formation of ozone and formaldehyde was followed analytically. From other analytical data it was possible to derive half-lives for NO, NO2, and hydrocarbon, as well as maximum reaction rates for propylene, either as the sole hydrocarbon or as a component of the exhaust. The various dependent variables are presented as functions of the reactant concentrations by means of contour diagrams derived by computer treatment. The effect of "hydrocarbon" and NO levels on smog effects are discussed; the observed relationships between end effects and reaction rates are considered. The study simulated the effects of varying degrees of vehicular emissions control over one or both reactants and has a bearing on the establishment of vehicle emission standards in California. (Author)##

00360

A. T. Stair, Jr., J. P. Kennealy, S. P. Stewart

OBSERVATION OF THE DELTA NU EQUALS 1 SEQUENCE OF OH PRODUCED IN THE H PLUS O3 REACTION. Planetary Space Sci. 13, 1005-8, 1965.

The Delta Nu equals 1 sequence of OH was obtained with 10cm to the minus one resolution from the H plus O3 reaction. A Michelson interferometer was used because of the relatively weak source. The spectra, in combination with overtone data, are of interest for studies of the hydroxyl emission of the upper atmosphere. (Author)##

00362

H. I Schiff

KINETICS OF ATMOSPHERIC GASES (FINAL REPT.) McGill Univ., Montreal, Canada, Upper Atmosphere Chemistry Group (Rept. No. AFCRL-66-1). Nov. 1965. 44 pp.

Summaries are presented on work already published in the literature. These include kinetics of atom and excited molecule reactions, and recombinations; absolute quantum yield measurements; and diffusion coefficients. The following summarizes work yet to be published. The reaction of O atoms with aluminum vapor was found to produce chemiluminescent flows which consisted of a continuum, whose intensity distribution was similar to that obtained from rocket experiments. The reaction of O atoms with trimethyl aluminum (TMA) also produced a chemiluminescent continuum. No resonance radiation corresponding to A10 emission could be produced by irradiating the reaction products with continuum or discrete light sources. The reactions of a number of metalorganic compounds with active nitrogen produced glows which consisted of a number of bands, some of which have not yet been identified as well as lines from excited metal atoms. The rate of reaction of TMA with molecular oxygen was studied using the mass spectometric technique. The rate constant was found to be (2 plus or minus 0.3) x ten to the minus sixteenth power cubic centimeters per molecule per second. The rate of the reaction of TMA with atomic oxygen was found to be grater than could be measured with this technique and must therefore occur at close to collision frequency. (Author)##

00374

J.K. Angell, D.H. Pack, G.C. Holzworth, C.R. Dickson

ANALYSIS OF TETROON FLIGHTS WITHIN THE LOS ANGELES BASIN. Preprint. J. Appl. meteorol. 5,(5) 565-72, Oct. 1966. 1965

Tetroon derived winds obtained within the Los Angeles Basin at

heights near 300 meters are compared with surface winds obtained from the network of the Air Pollution Control District. During the day the tetroon-derived modal direction is backed 25 degrees from the model surface wind direction but the modal speeds are practically the same. During the night the agreement is poorer. Illustrated are tetroon trajectory reversals associated with land and sea breeze flows. These reversals are considered from the point of view of the recirculation of air within the Basin, and evidence is presented for a diurnal recirculation. The average root mean square vertical velocity derived from tetroon height fluctuations is .54/ms over land and .21/ms over the sea. The average predominant period of vertical oscillation (defined as the period at which the spectral peak occurs) is 17 minutes over land and 9 min over the sea. Broadly speaking, the predominant period appears to be a function of lapse rate, in agreement with the Brunt-Vaisala formulation. The tetroon-tracking aircraft reported considerable turbulence when the root mean square vertical velocity was anomalously high (0.4-0.5/ms) in comparison with the predominant period (6-7 min), i.e., when there existed waves of large amplitude and short wave length. Tetroon flights over the Palos Verdes Hills exhibit a variety of vertical motion patterns, with a general tendency for the tetroon height to be a maximum just over the hilltop but for slight downward motion to occur about 1 km upwind from the hilltop. Two flights released simultaneously yield good evidence for the existenc of helical circulations over the land. These helices have lateral and vertical dimensions of about 600 meters and the tetroons complete a circuit in 20-30 min. (Author's abstract)##

00432

M. E. Morrison, R. G. Rinker, and W. H. Corcoran

RATE AND MECHANISM OF GAS-PHASE OXIDATION OF PARTS-PER-MILLION CONCENTRATIONS OF NITRIC OXIDE. Ind. Eng. Chem. Fundamentals 5(2):175-181, May 1966.

Rates of the air oxidation of parts-per-million concentrations of nitric oxide were studied homogeneously at atmospheric pressure and ambient temperatures in a constant-volume batch reactor. The initial concentration of nitric oxide was varied from 2 to 75 p.p.m., while the oxygen concentration ranged from 3 to 25 volume %. The initial order of the oxidation reaction in the absence of nitrogen dioxide was determined to be 2.00 plus or minus 0.09 for nitric oxide and 0.97 plus or minus 0.11 for oxygen. From initial rate data at 26.5 C., a third-order rate constant of (1.297) plus or minus 0.051) x 100,000 (104) liter 2-squared g. mole 2-squared sec. was obtained. The addition of nitrogen dioxide increased the initial oxidation rate, and that compound showed an auto-catalytic effect throughout the course of the reaction. A nonlinear least-squares analysis was used to develop a mechanism involving six reactions, with NO3, N2O3, and N2O5 as intermediates. Use of that mechanism gave a minimum standard deviation of 1.6 p.p.m. for the predicted concentrations of nitric oxide relative to the experimental data.##

00444

E. deBary, B. Braun, and K. Bullrich

TABLES RELATED TO LIGHT SCATTERING IN A TURBID ATMOSPHERE, VOLUME II. Air Force Cambridge Research Labs., Bedford, Mass., Office of Aerospace Research, Sept. 1965. pp. 353-580. (Rept. No. AFCRL-65-710 (-II).
CFSTI, DDC: AD 629 123

The tables present the results of computations of the intensity and the degree of polarization of sky radiation and radiation scattered by a unit volume of air containing natural aerosols. The tabulated data are based upon new values of the scattering functions i sub and i sub 2 and the scattering cross sections, derived usint the Mie theory with m equal 1.5. In the case of primary scattering of radiation, the results are valid for a turbid atmosphere. The tables of the scattering coefficients and optical thickness, the absolute scattering functions, the intensities, and the degrees of polarization are computed for various wavelengths between 0.4 and 1.2 microns and for discrete scattering angles between 0 and 180 degrees. Aerosol size distributions of the form dn(r) equal c.r sup minus nv dlogr, with nv equal 2.5, 3.0, and 4.0, are assumed. The lower and upper limits for the size range chosen as r sub 1 equal 0.04, 0.06, and 0.08 micron and r sub 2 equal 3,5, and 10 microns respectively.##

00446

A. Hiratsuka and K. Magome

PHYSIOLCGICAL EFFECTS OF THE AIR IONS. Mitsubishi Denki Giho (Tokyo) 40(3):473-475, Mar. 1966. Text in Japanese

A review of the field of air ions is presented. Studies on this subject made in Japan and other countries are described.##

00453

J.F. Detrie

(METHODS AND TECHNIQUES CARRIED OUT IN FRANCE IN THE FIGHT AGAINST ATMOSPHERIC POLLUTION.) Methodes et Moyens en Oeuvre en France pour Lutter contre la Pollution Atmospherique. Rev. Soc. Roy. Belge Ingrs. Ind. (Brussels) No. (5):207-217, May 1966. Text in French

legislative proposals put into effect in the Paris region over the last five years are reviewed. There is a close liaison established between private organizations, representing the hygiene specialists and private industry and public powers.

Studies carried out to determine the extent of pollution, that is, emission, dispersion, type of environment and its effect on pollution, demonstrated the problems involved with means of combating pollution. The solution cannot be found in generalized formulas which are too often recommended, and which mask the detailed effort necessary to obtain good carburetion and combustion of fuels and proper construction of buildings and equipment. (Author summary) ##

00455

E. deBary, B. Braun, K. Bullrich

TABLES RELATED TO LIGHT SCATTERING IN A TURBID ATMOSPHERE (VOLUME III.) Air Force Cambridge Research.Labs, Bedford, Mass., Office of Aerospace Research. (Rept. No. AFCRL-65 - 710(III) and Special Repts., No. 33). pp. 581-860. Sept. 1965.
CFSTI, DDC: AD 629 127

The tables present the results of computations of the intensity and the degree of polarization of sky radiation and radiation scattered by a unit volume of air containing natural aerosols. The tabulated data are based upon new values of the scattering functions i sub 1 and i sub 2 and the scattering cross sections, derived using the Mie theory with m equal 1.5. In the case of primary scattering of radiation, the results are valid for a turbid atmosphere. The tables of the scattering coefficients and optical thickness, the absolute scattering functions, the intensities, and the degrees of polarization are computed for various wavelengths between 0.4 and 1.2 microns and for discrete scattering angles between 0 and 180 degrees. Aerosol size distributions of the form dn(r) equal c.r to the minus nu power dlogr, with nu equal 2.5, 3.0, and 4.0, are assumed. The lower and upper limits for the size range were chosen as r sub 1 equal 0.04, 0.06, and 0.08 micron and r sub 2 equal 3,5, and 10 microns respectively. (Author abstract) ##

00465

A.P. Altshuller

AN EVALUATION OF TECHNIQUES FOR THE DETERMINATION OF THE PHOTOCHEMICAL REACTIVITY OF ORGANIC EMISSIONS. J. Air Pollution Control Assoc. 16(5):257-260, May 1966.

The concept that control of organic substances in emissions should be based on the relative ability to cause the effects associated with photochemical air pollution (reactivity) rather than on gross emission levels has gained wide acceptance. Two general types of reactivity response scales have been proposed. One of these is based on rates of hydrocarbon

reaction or nitrogen dioxide formation. This scale covers a wide range because of the very high rates associated with olefins having internal double-bonds. The other scale is based on product yields combined with biological measurements. This type of scale is considered superior to one based on rates. This latter scale covers a narrow response range because olefins with internal double bonds have only slightly higher product yields and biological effects than do other reactive olefins and alkylbenzenes. Use of a response scale based on product yields and biological effects also permits use of less detailed instrumental procedures. A simple subtractive column technique combined with a flame ionization analyzer should be sufficient to estimate hydrocarbon emissions. Gas chromatographic analyses of hydrocarbon emissions are of value when used with either type of reactivity response scale. However, detailed gas chromatographic analyses are essential for a response scale based on rates. The response scale based on product yields and biological effects indicates much less improvement in reactivity from fuel composition changes than would be predicted from a response scale based on rates. The most desirable approach is to use a variety of control and engine modification techniques to reduce all reactive organics to the lowest level possible.##

00502

W. J. Hamming, W.G. MacBeth, R.L. Chass

THE PHOTOCHEMICAL AIR POLLUTION SYNDROME AS EXHIBITED BY THE ATTACK OF OCTOBER 1965. Arch. Environ. Health., 14(1):137-149, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

The photochemical air pollution syndrome which occurred on the days of October 26, 27, 28, 1965, was typical and it followed the pattern set by previous smog attacks. These factors are: (1) low wind speeds to concentrate the pollution in one area, (2) low inversion heights so that little vertical mixing can occur to dilute the emitted materials, (3) a trajectory which carries the emitted pollution to Los Angeles Civic Center and to Pasadena and Azusa or Burbank in the afternoon, and (4) sufficient sunlight to photodissociate the NO2 formed, and to form nitric oxide and atomic oxygen. The results are high oxidant or ozone and large quantities of sub-micron size particles. In addition, eye irritants and "plant damaging" chemicals are formed. Some of these are, it is believed, formaldehyde, acrolein, PAN, chemical free radicals, other nitrates or nitroso compounds, and a peroxyformyl activated complex. Authors present sixteen (16) charts and tables to substantiate the events in this air pollution episode. They include meterology, concentrations of various oxidants, pulmonary blow resistance, and variations in eye irritation.##

00510

M. Neiburger

METEOROLOGICAL ASPECTS OF AIR POLLUTION IN RELATION TO BIOLOGICAL RESPONSES. Arch. Environ. Health 14(1):41-45, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

This report presents a brief review of the meteorological aspects of air pollution, as a background for the implications they have on biological and medical effects. The meteorological factors enter because they determine the rats of diffusion of pollutants, and thus the concentrations of contaminants in the air, given the configuration and intensity of the sources. The two factors which enter are the wind velocity and the vertical temperature gradient or lapse rate. Meteorological considerations will have to enter into the final determination of the air purity standards which will have to be met. Much research will be needed regarding the rates of diffusion from line and area sources, and especially the rates of removal of pollution. Much data will be required to define the air pollution potential of regions throughout the world. But we cannot await the answers to this research before requiring controls to the full extent presently feasible. Regulations are needed to enforce limiting every emission into the atmosphere to the lowest possible level, at the same time as we push research and developemnt programs seeking means of reducing further the contamination of the atmosphere.##

00602

J.N. Pitts, Jr., J.K. Foote, J.K.S. Wan

SOME CORRELATIONS BETWEEN SPECTROSCOPIC AND PHOTOCHEMICAL PROCESSES. Photochem. Photobiol. Vol. 4:323-333, 1965. (Presented at the Photochemistry and Photobiology Symposium, Fourth International Congress of Photochemistry and Photobiology, July 26-30, 1964, Oxford, England.)

By applying the modifier 'Space' to the terms 'Photochemistry' and "Spectroscopy' one implies a concern with electromagnetic radiation of wavelengths less than that found at the earth's surface and with energetic particles, particularly electrons. It has been observed that for certain classes of organic compounds useful empirical correlations exist between reactions induced by electron impact, non-ionizing ultraviolet radiation and ionizing radiation. These correlations allow qualitative or semi-quantitative predictions of specific reactions and/or reaction mechanisms which will occur during photolysis or radiolysis, based on known optical or mass spectra. In accord with recent spectroscopic evidence, benzene and toluene do not significantly react photochemically in their first absorption

band (at about 2500 angstroms); however, they react with a quantum yield approaching unity in their second and thired absorption bands (at about 2000 and 1850 angstroms respectively). The products of this decomposition are primarily carbon and/or polymer which deposit on cell windows, however, small yields of stable products have been isolated. Another example of this extrapolation from one technique to another deals with the correlation of cyclic elimination reactions observed in the mass spectra, photochemistry and radiation chemistry of various classes or organic compounds. Classic examples of this type of reaction are the photolytic and radiolytic elimination of olefins from esters and ketones having a hydrogen gamma to the carbonyl group (i.e., the elimination of ethylene from ethyl acetate and of propylene from methyl n-butyl ketone). Based on mass spectral correlations with the above reactions, the same type of elimination should be expected from a great number of compunds which contain hydrogens gamma to unsaturated groups. In those cases where the photochemistry or radiation chemistry of these compounds have been studied, an intramolecular cycloelimination of olefin has been observed to be an important process. It is suggested that mass spectra are a useful diagnostic tool for at least gross predictions in "space photochemistry" and "space photobiology", as well as in considering reactions of importance under primitive earth conditions. (Author abstract)##

00611

I. J. Leyshon D. H. Volman

THE PHOTOCHEMICAL REACTION OF HYDROGEN PEROXIDE WITH ALLYL ALCOHOL -3,3-D2. J. Chem. Soc. Vol. 87:5565-5568, 1965. (AFOD No. 3861:3.
CFSTI, DDC: AD 628 086

The reaction of hydroxyl radicals, derived from the photolysis of hydrogen peroxide, with allyl alcohol-3,3-d2 in the frozen state at 77 K. and in liquid solutions in the range 253-350 K. has been studied. An analytical method based on the gas phase reaction of water with sodium mirrors has been developed. For the reaction with sodium, the isotopic separation factor for protium and deuterium in water was found to be 1.8 in the range of 0-35% deuterium. For all the photochemical experiments, abstraction of deuterium atoms was shown to occur with 8.4 plus or minus 2.5% of the hydroxyl radicals formed; the remainder was considered to add to the olefinic bond. Electron spin resonance spectra of irradiated frozen samples showed that absorption of light by the deuterated allyl alcohol leads to cleavage of the carbon-oxygen bond and that the reaction of hydroxyl radicals with the alcohol is consistent with the interpretation that deuterium atoms are abstracted. (Authors abstract)##

00613

L. S. Jaffe

EFFECTS OF PHOTOCHEMICAL AIR POLLUTION ON VEGETATION WITH RELATION TO THE AIR QAULITY REQUIREMENTS. J. Air Pollution Control Assoc., 17(1) 38-42, 1967. 38 refs. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, California, June 20-25, 1966, Paper No. 66-43).

For purposes of clarification, a new term "PAN-type" oxidant, is recommended which more precisely defines, the phototoxicant complex found in photochemical smog formerly identified as "oxidant" causing silvering or bronzing of the lower leaf surfaces of vegetation. Since ozone has been identified as a phytotoxicant and is also an oxidant, it is recommended that the term "oxidant" be used only as a general term, identifying any oxidizing air pollutant. Based on current knowledge the oxidizing phytotoxicants present in photochemical smog can be classified into at least two types according to the syndromes formed: (1) Ozone, and (2) "PAN-type" oxidants. The "PAN-type" oxidant injury syndrome of plants can be caused by two classes of presently identifiable phytotoxicants: (1) The peroxyacyl nitrates, a homologous series of organic peroxidic nitrogen compounds isolated from photochemical smog (designated as PaNs); (2) the reaction products of ozoneolefin reactions, as yet unidentified. Each of these classes of phytotoxicants produces lower leaf surface injury (bronzing and silvering). The PaNs also cause lower leaf surface banding; the products of ozone-olefin reaction products, however, do not. Other oxidizing phytotoxicants, yet unidentified, may also be present in photochemical smog. (Author Abstract Modified) ##

00618

E. A. Schuck, J. N. Pitts, Jr., J.K.S. Wan

RELATIONSHIPS BETWEEN CERTAIN METEOROLOGICAL FACTORS AND PHOTOCHEMICAL SMOG. Intern. J. Air Water Pollution Vol. 10(10):689-711, Oct. 1966. (Presented at Photochemistry Symposium, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Apr. 20-22, 1964.)

By a method of averaging, involving a large amount of atmospheric monitoring data, it has been shown that interesting and perhaps valid information on the formation and intensities of smog symptoms can be obtained. For example, it has been shown that the concentration of maximum daily oxidant is a function of day of the week and that this function might be related to automotive traffic patterns. Thus for certain time periods maximum daily oxidant was at a minimum on weekends at stations in the northern protion of the Los Angeles Basin (Burbank, Pasadena, Azusa). During this same time period the maximum daily

oxidant was found to be at a maximum on weekends near certain cities in the southern portion of the Basin (Inglewood, Long Beach). These two distinctly different weekend patterns correspond in part to the recreational activities of the populace, and in addition, indicate that mixing is less than complete in the Los Angeles Basin. In spite of this lack of complete mixing the macimum daily oxidant at stations within a 600 to 800 square mile area are directly proportional to each other in a predictable fashion. The weekend daily temperatures are also affected presumably by the same factors which influence the weekend oxidant intensity. Changes in inversion height and wind speed appear to account for twofold changes in macimum daily oxidant values. Maximum daily oxidant concentration was also found to be directly related to the square root of light intensity with little if any dependence on temperature. This study also indicates that pollution levels are proportional to each other over large areas of the Basin. The analysis of atmospheric data indicates that variable hydrocarbon to oxides of nitrogen rations do exist i the atmosphere and that there exists a dependence of atmospheric smog symptom intensity upon this ratio.##

CC629

P. Ausloos and S. G. Lias

H2S AS A FREE-RADICAL INTERCEPTOR IN THE GAS-PHASE RADICLYSIS AND PHOTOLYSIS OF PROPANE. J. Chem. Phys. Vol. 44(2):521-529, Jan. 1966.

The gas-phase photolysis (1236 Angstrom units) and the gamma-ray radiolysis of C3D8 has been investigated in the presence of varying concentrations of H2S. When 10% or more H2S is added to C3D8, the majority of the D, CD3, C2D3, and C2D5 radicals abstract an H atom from H2S to form HD, CD3H, C2D3H, and C2D5H, respectively. The fully deuterated molecules formed in these mixtures result from the unimolecular elimination of a stable molecule from C3D8 or C3D8(plus) and from fast bimolecular processes such as ion-molecule reactions. The mechanisms of the radiolysis and the photolysis proposed in earlier studies have been re-examined in the light of the information derived from the C3D8 - H2S experiments and of some additional photolysis experiments on CD3CH2CD3 - NO mixtures. The modes of decomposition of the neutral excited propane molecule are indicated. The internally excited C2D4, C2D5, C3D6, and C3D7 species formed in these primary processes decompose to form D, CD3, C2D2, C2D3, and C2D4 unless they are collisionally stabilized. In the radiolysis of C3D8 - H2S mixtures, yields of the free radicals can be adequately accounted for by taking into account the modes of fragmentation of the parent ion and of the excited propane. The C2D5 (plus) ions are shown to react with H2S in part by the deuteron-transfer reaction. The effect of pressure and the effectiveness of HI as a free-radical interceptor in the radiolysis have been examined. (Author abstract)##

00748

D.M. Baulch

RELATION OF GUSTINESS TO SULFUR DIOXIDE CONCENTRATION. J. Air Pollution Control Assoc., 12(11):539-542, Nov. 1962.

Sulfur dioxide concentrations are related to variations of horizontal wind direction, classified according to criteria of gustiness developed at Brookhaven National Laboratory. Five gustiness classes (A, B1, B2, C, and D) are established in order of decreasing amplitude of the azimuthal fluctuation of the wind. In Nashville, Tennessee, SO2 concentrations were measured at 7 selected sites, and concurrent samples form these sites were averaged to obtain an approximation of the mean SO2 concentrations over the study area. Data from the 6-mon study period indicate an inverse relationship between frequencies of type B1 and SO2 concentration, and a direct relationship between occurrence of gustiness type D, the stable wind class, and SO2 concentration. Relationships of the less frequently occurring types (A, B2, and C) were indeterminate, indicating a need for application of the method over a longer period of time. (Author's abstract) ##

00757

A.P. Altshuller J.J. Bufalini

PHOTOCHEMICAL ASPECTS OF AIR POLLUTION: A REVIEW. Photochem. Photobiol., Vol. 4, 97-146, 1965.

Materials that are emitted in the atmosphere are subjected to a number of interesting and unusual reactions. These reactions lead to many products whose deleterious effects have now been recognized as one of the most pressing problems in urban areas throughout the world. These effects can be observed in reduced visibility, eye irritation, plant damage, cracking of rubber, and corrosion of metals. This paper is concerned with the present state of the problems in air pollution, with emphasis on recent literature. The chemical aspects are covered in some detail through 1963. The biological effects are surveyed more briefly, with literature reviewed up to the fall of 1963. ##

00764

R.A. McCormick

WEATHER PREDICTION AND SMOG ATTACKS. Preprint. (Presented at the A.S.C.E. Environmental Engineering Conference, Salt Lake City, Utah, May 11-15, 1964.)

The paramount contributions that meteorological science can make to the solution of air pollution problems are in the areas of

forecasting air pollution potential and air pollution concentrations. Systematic programs and services have been accomplished to provide the former on both local and nationwide scales. Improvement in those services can be expected to follow the progress in weather forecasting in general. Methodologies to predict air pollution concentrations will develop more slowly, largely because of the paucity of non-meteorological input data on pollutant emissions. Following the success of pilot studies, comprehensive projects that may lead to schemes for forecasting pollutant concentrations are under way in St. Louis, Missouri, Chicago, Illinois, and New York City. (Author abstract) ##

00773

J.J. Bufalini A.P. Altshuller

KINETICS OF VAPOR PHASE HYDROCARBON - OZONE REACTIONS. Can. J. Chem. 43,2243-2250, 1965.

The reaction of nine olefinic and aromatic hydrocarbons with ozone in the vapor phase have been investigated in static and dynamic systems. Some of the rate constants for the olefin-ozone reactions are in good agreement with previously published data, whereas others are larger than values previously reported. Rate constants for trans-2-bueene-, isobutene-, and ethylene-ozone reactions were measured between 30 and 100 degrees C. The activation energies for the reaction of ozone with trans-2-butene, isobutene, and ethylene are 0.2 plus or minus 0.3, 2.8 plus or minus 0.4, and 4.2 plus or minus 0.4 kcal/mole. In general, the reactions of hydrocarbons with ozone are nonstoichiometric. However, these reactions do appear to be second order. The rates of reaction between alkylbenzenes and ozone are too low to be of importance in air pollution studies. (Author abstract) ##

00783

D.A. Lynn, B.J. Steigerwald, J.H. Ludwig

THE NOVEMBER-DECEMBER 1962 AIR POLLUTION EPISODE IN THE EASTERN UNITED STATES. Public Health Service, Cincinnati, Ohio, Bodiv. of Air Pollution. (999-AP-78) 1964. 28pp.

This report documents the subject "episode" with respect to meteorology, air quality, and public reaction. Particulate and gaseous air quality data are reported and discussed. Meteorology and public reaction are discussed with reference to the Public Health Service program of Air Pollution Potential Forecasts. Epidemiological aspects are not considered. (Author abstract) ##

00787

I.S. Jaffe H.D. Estes

OZONE TOXICITY HAZARD IN CABINS OF HIGH ALTITUDE AIRCRAFT - A REVIEW AND CURRENT PROGRAM. Aerospace Med., 34(7):633-643, July 1963 and J. Aircraft, 1(3):157-158, June 1964. (Presented at the AIAA Summer Meeting, Los Angeles, Calif., June 18-20, 1963.)

Ozone is present in significant quantities in the atmosphere starting above the tropopause and in toxic concentrations in the stratosphere reaching a peak at about 70,000-90,000 feet. Height ambient zone concentrations of 5-10 ppm are found at altitudes of 65,000-80,000 feet through which the supersonic transport will cruise. The air used for cabin pressurization passes through the compressors very quickly, too quickly to destroy all the ozone present by adiabatic heating. Unacceptable concentrations of ozone will be present in the cabin environment of the SST unless devices are employed. It is recommended that additional research be performed in the area of time/temperature relationships of air compressors of turbo-jet turbo-ramjet and/or other proposed types of SST propulsion to develop adequate techniques of ozone destruction. (Author summary modified)##

00789

J.N. Pitts, Jr., L.D. Hess, E. J. Baum, E.A. Schuck, J. K. S. Wan

THE TRANSFER AND CONVERSION OF ELECTRONIC ENERGY IN SOME "MODEL" PHOTOCHEMICAL SYSTEMS. Photochem. Photobiol., Vol. 4:305-21, 1965. (Presented at the Rapporteur Session, the Fourth International Congress of Photobiology, Oxford, England, July 26-30, 1964.)

Recent studies of the effects of molecular structure and reaction environment on the mechanism of primary photochemical processes involving transfer and conversion of electronic energy in relatively "simple" organic molecules are presented and discussed. A quantitative i.r. spectroscopic method for studying intramolecular and intermolecular photoprocesses of u.v. irradiated substrates dispersed in solid alkali halide matrices at room temperature is described. Current data for the substrates ortho-nitrobenzaldehyde, anthracene and benzophenone-benzhydrol are presented. A series of 'model' ketones containing cyclopropyl groups have been synthesized and while their adsorption spectra are similar, the efficiency of vapor-phase photodissociation into radicals is shown to be strongly dependent on molecular structure. Butyrophenone and a series of ring substituted derivatives have been photolyzed in the liquid phase using the quantum yield of the photo-elimination of ethylene (Type II split) as a "probe" to determine the effect of substituents on the internal H atom abstracting power of the

excited carbonyl chromophore. Phi sub C2H4 is very sensitive to ring substitution, dropping grom 0.24 in butyrophenone to 0.20, 0.058 and 0.00 in the p-CH3, p-OCH3 and p-NH2 derivatives respectively, and to 0.00 in both ortho and para hydroxy derivatives. This effect is correlated with their absorption spectra in terms of the lowest states of these alkyl aryl ketones. While several 'classic' photochemical reactions, unimolecular and bimolecular, proceed efficiently in solid KBr matrices giving the same product as in liquid systems, the 'model' cyclopropyl compounds and the alkyl aryl ketones did not undergo their usual intramolecular processes. Implications of this molecular environment effect are pointed out. (Author abstract) ##

00834

C.S. Benson

ICE FOG: LOW TEMPERATURE AIR POLLUTION (DEFINED WITH FAIRBANKS, ALASKA AS TYPE LOCALITY). Alaska Univ., College, Geophysical Inst. Nov. 1965. 196 pp.
CFSTI, DDC: AD 631553

Ice fog crystals are an order of magnitude smaller than diamond dust, or cirrus cloud crystals, which in turn are an order of magnitude smaller than common snow crystals (0001, 0.1 and 1 to 5 mm respectively). The differences in size are shown to result from differences in cooling rates over 5 orders of magnitude. Most of the ice fog crystals have settling rates which are slower than the upward velocity of air over the city center. The upward air movement is caused by convection cells driven by the 6 C "heat island" over Fairbanks. This causes a reduced precipitation rate which permits the density of ice fog in the city center to be three times greater than that in the outlying areas. The inversions which occur during cold spells over Fairbanks begin at ground level and are among the strongest and most persistent in the world. They are three times stronger than those in the inversion layer over Los Angeles. Thus, the low-lying air over Fairbanks stagnates and becomes effectively decoupled from the atmosphere above, permitting high concentrations of all pollutants. The combustion of fuel oil, gasoline, and coal provides daily inputs of: 4.1 x 10 to the sixth power kg CO2; 8.6 x 10 to the third power kg SO2; and 60, 46 and 20 kg of Pb, Br and Cl respectively, into a lens-like layer of air resting on the surface with a total volume less than 3 x 10 to the ninth power cubic meter. The air pollution over Fairbanks during cold spells couldn't be worse, because the mechanisms for cleaning the air are virtually eliminated while all activities which pollute the air are increased. (Author abstract modified) ##

00840

D.G. Murcray, F.H. Murcray, W.J. Williams

BALLOON BORNE INFRARED STUDIES (FINAL REPT.). Denver Univ., Colo., Physics Dept., Sept. 30, 1965. 26 pp.
CFSTI, DDC: AD 625349

The primary objective of this program was to obtain experimental data concerning the infrared spectral transmittance of the earth's atmosphere at high altitudes. Data pertinent to this objective were obtained by studying the variation of the infrared solar spectrum with altitude. Instrumentation capable of measuring selected portions of the infrared solar spectrum while it is carried aloft by balloons was constructed and flown a number of times as part of this program. A description of the instrumentation used to obtain these data and a summary of the flights made during the program are given. A secondary objective was to measure the variations with altitude of the infrared radiation emitted by the earth and its atmosphere. These measurements were also made with balloon borne instruments. The instrumentation used for making these measurements is described and a summary is also given of the flights made with this instumentation. (Author abstract)##

00851

MONTHLY REPORT OF METEOROLOGY, AIR POLLUTION EFFECTS AND CONTAMINANT MAXIMA (MARCH 1966 WITH OUTLOOK FOR MAY). Air Pollution Control District, Los Angeles, Calif., Technical Services Division. Mar. 1966, 15 pp.

Contains data for the Los Angeles County area for March 1966 on inversion base heights, mixing heights, average wind speed, precipitation, visibility, number of smog warning days, and a daily log of selected weather conditions. Six pages are devoted to daily maxima for carbon monoxide, nitrogen oxides, ozone, sulfur dioxide, and beta-radioactivity. Cumulative totals for selected meteorological and air pollution data through March are given plus average pollution and weather conditions for May (1950-1965); statement on the outlook for May 1966 is also provided.##

CC921

Altshuller, A. P., I. R. Cohen, and T. C. Purcell

PHOTOXIDATION OF PROPIONALDEHYDE AT LOW PARTIAL PRESSURES OF ALDEHYDE. Can. J. Chem., 44(24):2973-2979, Dec. 15, 1966. 16 refs.

Whether the mechanism for aldehyde photooxidation would be the same or somewhat different at low concentrations of aldehyde, and high partial pressure of oxygen, is discussed in this paper. The results presented provide additional evidence for the increasing importance of the hydroperioxide as a product with decreasing partial pressure of the aldehyde. The experimental results also indicate that the reactions to form carbon monoxide and ehtyl hydroperoxide can be important steps in the photooxidation of aldehydes.##

00929

CONTINUOUS AIR MONITORING PROGRAM IN CINCINNATI, 1962-1963. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, (999-AP-21). Jan. 1965. 193 pp.

This report presents results of the operation of the Public Health Service Continuous Air Monitoring Program (CAMP) in Cincinnati, Ohio, during 1962 and 1963. Data on atmospheric levels of sulfur dioxide, nitric oxide, nitrogen dioxide, total oxidants, total hydrocarbons, and carbon monoxide are analyzed and discussed. The data are tabulated as hourly, daily, and monthly mean concentration. Background information about Cincinnati and descriptions of the instrumentation are included. (Author abstract)##

00935

J. N. Pitts, Jr., R. Simonaitis, and J. M. Vernon

LIQUID PHASE PHOTOLYSIS OF Y-BUTYROLACTONE. Tetrahedron Letters, No. 36:3209-3213, 1965.

In view of the variety of interesting photochemical reactions reported for saturated cyclid ketones and acyclic esters and the lack of similar studies on lactone, the authors have photolysed representatives of the latter class of compounds and report here preliminary results with gamma-butyrolactone. Vacuum degassed butyrolactone was irradiated in a quartz cell (9 ml) with a Hanovia medium pressure SH lamp, and gaseous products were separated by conventional high-vacuum techniques. The major products, carbon monoxide, carbon dioxide, cyclopropane and ethylene (relative amounts 2.5 : 0.9 : 0.9 : 1.0), were identified by comparison of gas chromatographic retention times (Hexadecane, 25 degrees) and mass spectra with those of authentic materials. In addition, traces of ethane, propane and propylene were characterised by gas chrcmatographic comparisons.##

00952

A. C. Harkness and F. E. Murray

GAS PHASE OXIDATION OF METHYL SULFIDE. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-58.)

Methyl sulfide and oxygen react explosively at temperatures as low as 210 degrees. At 195 degrees, the nonexplosive reaction exhibits an initiation stage and a main stage. The rate of the

main stage as determined from pressure-time curves is linearly dependent on initial oxygen pressure, but substantially independent of initial methyl sulfide pressure. The activation energy of the main stage is 42 kcal/mole. The extent of the initiation stage is reduced by increasing oxygen pressure. The main oxidation products are sulfur dioxide and carbon monoxide. Even with an excess of oxygen not all methyl sulfide reacts. (Author abstract)##

00955

R. Kovitz

GAINING PUBLIC ACCEPTANCE FOR CALIFORNIA'S AUTO SMOG CONTROL PROGRAM. J. Air Pollution Control Assoc. 17, (1) 26-7, Jan. 1967. (Presented at the 49th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-67.)

Author discusses the Motor Vehicle Control Board (MVCB) action in California. The emphasis is placed on community/individual awareness and acceptance. Releases by all news media and the use of billboards are the salient avenues being attempted.##

01027

B. J. Gordon

PHOTOCHEMICAL MEASUREMENTS OF ULTRAVIOLET SUNLIGHT. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-38.)

Measurements of solar ultraviolet radiation intensity were made, using two photochemical reactions. These were the gas-phase bag photolysis of NO2 in nitrogen and the photoisomerization of o-nitrobenzaldehyde in liquid solution. Results of the two methods were converted, as nearly as possible, to absolute light intensities. The two sets were compared and, as applied, it appears that the solution method is simpler and gives more consistent results. It should be noted, however, that atmosphere NO2 will affect the two methods to different degrees. A continuous recording actinometer based on the solution method was developed and gave satisfactory initial trial runs.##

01103

F. A. Lombardo

DISCUSSION OF THE MOELLER RADIATION CHART (MASTER'S THESIS). (For the degree of Master of Science, Utah Univ. (Salt Lake City) Dept. of Meterology. June 1966. 29 pp.
CFSTI: AD 480640

Moller's assumptions for the carbon dioxide-water vapor overlap region, which lead to the construction of his radiation chart, are reinvestigated in the light of modern theory. A new radiation chart is constructed using water vapor and carbon dioxide absorption data as furnished by Moller and Elsasser respectively. The results of the radiative fluxes computed from the new chart are compared with equivalent results using the original Moller and the revised Elsasser radiation diagrams, as well as with measurements. (Author abstract) ##

01106

I. Burak and A. Treinin

THE PHOTOCHEMISTRY OF N3(-) IN AQUEOUS SOLUTION AT 254 MILLIMICRONS. J. Am. Chem. Soc., 87(18):4031-4036, Sept. 20, 1965.
CFSTI, DDC: AD 632 063

Irradiation of evacuated aqueous solutions of N3- at 254 micrograms leads to the production of N2 NH2OH, H2N2H4, and NH3. At low N3- concentration (less than 10 to the minus three M) the photolysis has the following stoichiometry: N3(-) plus 2H2O(hmu) N2 plus NH2OH plus Oh(-) and the quantum yield is 0.27. The quantum yields of N2 and NH2OH depend on the concentration of N3- in a way that suggests a competition between N3- and H2O in reacting with the same intermediate. The intermediate is probably the NH radical in its singlet state produced by the reaction of excited N3- with water. NH2OH is formed by the direct addition of NH to water. The effect of adding NH3 to the system was tested. The results indicate that NH3 scavenges the NH radical to form N2H4. The rate constants for scavenging of NH by H2O, NH3, and N3(-) are in the following ratio: 1:18:285, respectively. The reaction of NH with N3(-) is responsible for the formation of N2H4,H2, NH3, and further quantities of N2. The diimide molecule appears to play a prominent role here. The nature of the proposed reactions is discussed. (Author abstract) ##

C1146

N. P. Carleton

LABORATORY STUDIES OF ATOMIC AND ELECTRONIC COLLISION PROCESSES

RELEVANT TO THE STUDY OF THE UPPER ATMOSPHERE . Harvard Univ., Cambridge, Mass. Final Rept. AFCRL-63-612 May 6, 1963. 23p.
CFSTI,DDC: 631 410

Electron-molecule and molecule-molecule collisions at energies of a few volts or less were studied with applications to atmospheric reaction. Ion-molecule and molecule-molecule collisions in the range of 200-2000 ev energy were studied with applications to meteor physics. Excitation of metastable states in O2, N2, and O by electron impact, and of the subsequent reactions of these metastable states with other gases, including excitation transfer and also actual chemical reaction were studied with a thermal molecular beam technique. The production of negative ions at heated surfaces were studied with the purpose of resolving a controversy over the value of the electron affinity of atomic oxygen. Recent data on electron collisions was used to study the problem of electron heating by electric fields in the ionosphere, investigating, in particular, which features of the airglow and aurora may be caused by electron-impact excitation by the heated electrons. The red lines of atomic oxygen, 6300-6364 A, are almost certainly excited by this means in low-latitude auroral forms, but no other emission in the airglow or aurora is so excited. In the higher energy range excitation and charge transfer were studied in collisions of N plus 2, Ar plus, Ne plus, K plus, Na plus, Mg plus, and Ca plus with N2 and Ar. The excitation and ionization which is produced by micrometeorites too small to be observed individually on their entry into the atmosphere were considered.##

01145

W. Zdunkowski, D. Henderson, and J. V. Hales

THE INFLUENCE OF ATMOSPHERIC CONSTITUENTS UPON LONG WAVE RADIATION IN CONJUNCTION WITH THE FORMATION OF RADIATION FOG . Intermountain Weather, Inc., Salt Lake City, Utah (Final Rept., June 1964 - Mar. 1966, Rept. No. 3) (Rept. ECOM-00122-F). April 1966, 99 p.
CFSTI,DDC: AD 631490

This project deals with the prediction and maintenance of radiation fog. A system of physical equations, modelling the atmospheric boundary layer, is solved by numerical means. Temperature changes in fog-free air and within fog are discussed. The significance of soil parameters and exchange coefficients is studied systematically and shortcomings of the classical theory are pointed out. (Author abstract)##

C1194

P. Grovenstein, Jr.

PHOTOCHEMICALLY INDUCED REACTIONS OF ACETYLENES WITH AROMATIC COMPOUNDS (FINAL REPT.) Georgia Inst. of Tech., Atlanta, Engineering Experiment Station. Aug. 1965. 30 pp.
DDC: AD 470946

Irradiation with ultraviolet light of a mixture of benzene and acetylene under a variety of experimental conditions gave, at best, only a trace of cyclooctatetraene. No photo-adduct could be found of acetylene with dimethyl phthalate, naphthalene, or anthracene. Vinylene carbonate underwent no detectable photochemical reaction with benzene. Chlorovinylene carbonate, however, upon irradiation in benzene or cyclohexane solution undergoes reduction to give vinylene carbonate in good yield. Benzene with a solution of the monopotassium salt of acetylenedicarboxylic acid gives, upon ultraviolet irradiation, a different product from that obtained with dimethyl acetylenedicarboxylate. Naphthalene, upon irradiation with a solution of dimethyl acetylenedicarboxylate, gives a complex mixture of products which appear to be the result of an initial 1,2-addition of the acetylenic ester to the various aromatic multiple bonds of naphthalene. From the reaction mixture a crystalline derivative has been isolated which seems to have been derived from addition of dimethyl acetylenedicarboxylate to the 1,2-position of naphthalene. Furthermore, vapor phase chromatography (v.p.c.) provisionally indicates the presence of dimethyl phthalate, dimethyl naphthalene-2,3-dicarboxylate, dimethyl cyclooctatetraene-1,2-dicarboxylate, as well as napthalene and dimethyl acetylenedicarboxylate in the purified reaction product. Since it was demonstrated that all of the naphthalene should have been removed by the purification process, the v.p.c. results indicate that the naphthalene adducts are undergoing pyrolysis under the conditions of the v.p.c. analysis. Reaction schemes are proposed to account for the observed products. Preliminary experiments show that phenanthrene reacts readily with dimethyl acetylenedicarboxylate upon irradiation with ultraviolet light. In experiments in which benzophenone was added as a photo-sensitizer, benzophenone was found to undergo addition of alcohol, especially methanol, to give considerable amounts of mixed pinacol. (Author abstract) ##

01203

R. J. Pilie

PROJECT FOG DROPS: INVESTIGATION OF WARM FOG PROPERTIES AND FOG MODIFICATION CONCEPTS . Cornell Aeronautical Lab., Buffalo, N. Y. Jan. 1966. 78 pp.
NASA: CR-368

Dynamic models have been formulated for advection, radiation and steam fog for various temperature, roughness and stability conditions. For each of the fog types, height distributions of temperature, liquid water content and visibility are given. These models have contributed significantly to our understanding of warm fog and the mechanisms that act to determine fog properties. In the laboratory, ionic surfactants were found to substantially inhibit the coalescence of water droplets with a plane water surface. On the other hand, coalescence of treated 300 microns radius drops colliding in air was not appreciably influenced by the presence of surfactant. It will be necessary to conduct experiments with colliding drops having sizes more nearly representative of natural fog (i.e. approximately 50 microns diameter). Surface treatment of sodium chloride crystals (a type of condensation nucleus found in the atmosphere) with hexadecanol

and octadecanol was shown to substantially retard the growth rate of droplets formed on such nuclei. Nuclei could not, however, be prevented from participating in droplet growth except when impractically thick layers of surfactant were present. Measurements were made of the drop size distributions in fogs occurring in the Buffalo area. Evaluated data were in good agreement with the values given by the physical fog models. In future observations, the measured average drop size is likely to be somewhat lower owing to a recent improvement in sampling technique designed to reduce preferential capture of larger drops. (Author summary)##

01204

N. W. Rakestraw

CACR SYMPOSIUM ON ATMOSPHERIC CHEMISTRY, CIRCULATION AND AEROSOLS. Office of Naval Research, London, England (Rept. No. ONRL-C-28-65). Dec. 30, 1965. 26 pp.
DDC: AD 476-981

A scientific meeting at which 80 papers were read by research workers in meteorology and atmospheric chemistry and physics, on such subjects as: the evolution of the atmosphere, atmospheric constituents - natural and artificial, radioactivity and nuclear "debris" in the atmosphere, chemical and physical processes taking place in the atmosphere. (Author abstract)##

01244

J. J. Bufalini and J. C. Purcell

NITROGEN: FORMATION BY PHOTOOXIDATION OF ETHYLENE IN THE PRESENCE OF ITS OXIDES . Science 150, (3700) 1161-2, Nov. 26, 1965.

The apparent lack of nitrogen balance for the photooxidation systems containing olefin and nitrogen oxides can be explained by evidence for the production of molecular nitrogen; molecular nitrogen was identified by gas chromatography and mass spectrometry. (Author abstract)##

01264

F. C. Alley, G. B. Martin, and W. H. Ponder

APPARENT RATE CONSTANTS AND ACTIVATION ENERGIES FOR THE PHOTOCHEMICAL DECOMPOSITION OF VARIOUS OLEFINS . J. Air Pollution Control Assoc. 15, (8) 348-50, Aug. 1965.

The photochemical reaction of various olefins and nitrogen dioxide

was studied under conditions of controlled temperature, pressure, and humidity in a 200 liter stirred glass reactor. The hydrocarbon concentration in the reactor during four and five hour irradiation periods was monitored with a flame ionization chromatograph. Reaction rate constants, based on three consecutive first order reactions, were calculated for reactor temperature of 20, 25, 30, and 35 degrees centigrade. Activation energies for the three consecutive reactions were calculated from the Arrhenius equation. Branched and straight chain olefins were studied at initial concentrations of 5.0 to 10.0 parts per million. (Author abstract)##

01305

R. Lindzen R. Goody

RADIACTIVE AND PHOTOCHEMICAL PROCESSES IN MESOSPHERIC DYNAMICS: PART I, MODELS FOR RADIATIVE AND PHOTOCHEMICAL PROCESSES. J. Atmospheric Sci., 22(4):341-348, July 1965.

The equations for the photochemistry of ozone and radiative heating in the mesosphere are, for certain regions, reduced from differential-integral equations to much simpler differential-algebraic equations which are more readily incorporated into hydrodynamic models. The simplified equations are first solved for joint radiative-photochemical equilibrium; the distributions obtained are in fair agreement with the more detailed calculations of Leovy (1964). The equations for temperature and ozone, with advection included, are linearized in terms of perturbations on the equilibrium fields, and a brief discussion of the effect of photochemistry, radiative transfer and their interaction on the thermal response to a field of motion is presented. Finally, the problem of the joint photochemical-radiative relaxation of perturbations in the absence of motion is investigated. It is found that the coupling sharply accelerates thermal relaxation above 35 km, and appreciably accelerates photochemical relaxation and decelerates thermal relaxation in a region in the neighborhood of 26 km. The coupling also leads to oscillating relaxation in the neighborhood of 30 km. (Author abstract)##

01326

Haagen Smith, A. J.

PHOTOCHEMISTRY AND SMOG. J. Air Pollution Control Assoc., 13(9):444-446, 4454, Sept. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Michigan., June 9-13, 1963.)

Photochemical reactions in smog are revieved. The roles of concentration, sunlight, reaction kinetics, ozone, activation energy, ultraviolet radiation, nitrogen dioxide dissociation, chain reaction, olefins, free radicals, and peracyl nitrates are considered.##

01396

J.B. Hodkinson

CALCULATIONS OF COLOUR AND VISIBILITY IN URBAN ATMOSPHERES POLLUTED BY BASEOUS NO2. Intern. J. Air Water Pollution, Vol. 10:137-144, 1966.

Calculations are made of the optical effects of persistent gaseous NO2 pollution at 0.2-2 ppm in a city atmosphere in both the presence and absence of a polluting aerosol which does not absorb light or NO2. It is concluded that the colouring of the horizon sky and of distant white objects would resemble whisky, tea or cola-drinks, and the visual range would be markedly reduced. (Author abstract)##

01405

B. M. Herman and D. N. Yarger

SOME EFFECTS OF MULTIPLE SCATTERING ON HEATING RATES IN THE OZONE LAYER. J. Atmospheric Sci. 23, 320-4, May 1966.

The effects of multiple scattering on the heating rates in the ozone layer are investigated. Computations are performed for two wavelengths, one rather highly absorbing, 3112A, and one rather weakly absorbing, 3323A, and for three solar elevation angles. These results are compared with heating rates computed on the basis of a Beer's law type of exponential absorption, neglecting all scattering. It is shown that, at the weakly absorbing wavelength, and for small zenith angles, the effect of scattering is such as to increase the heating rate by about 40 per cent. At the more highly absorbing wavelength, scattering effects are small and may safely be neglected. (Author abstract)##

01406

R. S. Lindzen

RADIATIVE AND PHOTOCHEMICAL PROCESSES IN MESOSPHERIC DYNAMICS: PART II, VERTICAL PROPAGATION OF LONG PERIOD DISTURBANCES AT THE EQUATOR . J. Atmospheric Sci., Vol. 23:334-343, May 1966.

This paper considers the vertical propagation of a long-period, small-amplitude perturbation in a medium in which radiative transfer and photochemistry play important roles. The perturbation and the basic field are assumed to be axially symmetric and symmetric about the equator; the basic wind field is geostrophic and the basic temperature field is in radiative equilibrium. It is found that long-period perturbations can only

propagate by virtue of the physical effects of radiative transfer and photochemistry. The computed wave propagates downwards and, for a period of 2.2 years, the phase speed is close to the observed speed of 1.5 km/month for the "26-month" equatorial oscillation. The observed relative phases of velocity and temperature fields, and the sharp attenuation of the oscillation below 20 to 25 km are also found in the model wave. There are discrepancies between the model and the observed "26-month" oscillation, which are to be expected in view of the nonlinearity of the observed phenomenon. However, it appears that, for complex reasons, the observed wave may satisfy equations similar to those occurring in the linear theory. (Author abstract)##

01407

R. S. Lindzen

RADIATIVE AND PHOTOCHEMICAL PROCESSES IN MESOSPHERIC DYNAMICS: PART III, STABILITY OF A ZONAL VORTEX AT MID-LATITUDES TO AXIALLY SYMMETRIC DISTURBANCES . J. Atmospheric Sci., Vol. 23:344-349, May 1966.

The stability of a baroclinic, axially symmetric vortex on an f-plane to axially symmetric disturbances is investigated. It is found that with photochemistry and radiative transfer acting, such disturbances are unstable regardless of the value of the Richardson number. The growth rates under conditions relevant to the mesosphere are, however, very small. (Author abstract)##

01408

R. S. Lindzen

RADIATIVE AND PHOTOCHEMICAL PROCESSES IN MESOSPHERIC DYNAMICS: PART IV, STABILITY OF A ZONAL VORTEX AT MID-LATITUDES TO BARO-CLINIC WAVES . J. Atmospheric Sci., Vol. 23:350-359, May 1966.

The models developed in Part I for radiative transfer and ozone photochemistry in the mesosphere are incorporated into a two-level model for baroclinic flow, and the effect of radiative and photochemical processes on the stability of the flow is separately investigated for radiative and photochemical conditions obtaining at 30 km and 52.5 km. In each case it is found that the flow is unstable for all non-zero values of shear, in contrast to the adiabatic case where instability required that the shear exceed some critical shear.
At 30 km the instabilities at low shears differ considerably from the instabilities for higher shears near the critical shear of the adiabatic theory. The latter have a dominant wavelength of the order of 10,000 km and a phase speed relative to the mean zonal wind of about - 20 m/sec. The former have a dominant wavelength of about 5000 km and a relative phase speed of about-2 m/sec. The effect of the advection of

ozone on the heating appears to be responsible for the low shear mode. This effect is negligible at 52.5 km where there are no significant differences (apart from growth rate) between low and high shear instabilities. The instabilities at this level have a dominant wavelength of about 7900 km and a relative phase speed of about - 20 m/sec. (Author abstract)##

01412

W. Zdunkowski, D. Henderson, and J. V. Hales

THE EFFECT OF ATMOSPHERIC HAZE ON INFRARED RADIATIVE COOLING RATES . J. Atmospheric Sci., Vol. 23:297-304, May 1966.

The radiative flux divergence is computed for the lower few centimeters of the atmosphere assuming a water vapor-haze mixture. Some additional computations are made for higher altitudes also, The haze model, based on Deirmendjian's formulation, is used to obtain the scattering and absorption coefficients from Mie theory, which are employed in radiative transfer equations. This new formulation of the radiative transfer equation takes into consideration the combined effects of water vapor and particle absorption, as well as primary particle scattering. The influence of the albedo of the earth and the interface temperature discontinuity is taken into consideration. Results show that the incorporation of a reasonable interface temperature discontinuity of the earth's surface is of higher order of importance than the haze influence near the surface. (Author abstract)##

01481

Nader, J. S. (ed.)

PILOT STUDY OF ULTRAVIOLET RADIATION IN LOS ANGELES, OCTOBER 1965. (A REPORT ON CONCURRENT MEASUREMENTS MADE BY COOPERATING ORGANIZATIONS BY VARIOUS METHODS.) Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-38, 91p., (Presented at the Fourth International Biometeorological Congress, Rutgers Univ., New Brunswick, N.J., Aug. 26 - Sept. 2, 1966.)

Measurements of 300-380-nm UV radiation in Los Angeles were conducted under varying conditions of smog environment, below and above the urban smog layer, and at various elevations through the smog atmosphere in October 1965. The UV energy incident on a horizontal plane surface detector near ground level at solar noon on a clear day (no smog) was 31 w/m square meter or 37% of the maximum possible for that date based on the value of 85 w/sq m of UV radiation entering the earth's atmosphere. Attenuation of UV radiation varied with smog intensity. Transmission through the atmosphere from 5700 feet (Mt. Wilson) to 350 feet (Laboratory rooftop) above sea level, average through the day, was 87% for a clear day and 65% for a moderate-to-heavy-smog day. Outgoing radiation was significantly increased by the smog environment. In heavy smog, values were higher by a factor of

about 2 than those obtained in a no-smog environment. Outgoing radiation also tended to increase exponentially with elevation. UV scatter or transmission measurements appear to offer potential as a sensitive method of monitoring environmental smog levels as an alternative to visibility which is subjective and semiquantitative. The high scattering capability of a smog atmosphere points to the need of measurements of UV radiation in all directions, particularly as this applies to photochemical reactions in the atmosphere, and a correlation of such measurements with measurements of vertical components. (Author's summary)##

01458

H. G. Hunt

PHOTOCHEMISTRY OF OZONE IN A MOIST ATMOSPHERE. J. Geophys. Res., 71(5):1385-1398, Mar. 1, 1966.

A detailed investigation has been made into the photochemistry of ozone in an atmosphere containing hydrogen. It is shown that for such an atmosphere a satisfactory ozone profile can be obtained, unlike the situation now existing for an oxygen only atmosphere. Equilibrium vertical distributions are calculated for nine gas concentrations, and the influence of atomic hydrogen in the mesosphere and the hydroxyl and perhydroxyl radicals in the stratosphere on the ozone concentration are shown to be significant factors. A non-equilibrium investigation is also made in which the variations of the gas concentrations are calculated as a function of the time of day. In particular, the results illustrate the variations of the gas concentrations at night and indicate that the altitude range 70 to 80 km appears to be very active photochemically at this time. The rate of formation of hydroxyl is analyzed to obtain an estimate of the diurnal variation of the hydroxyl airglow emission, as well as the vertical distribution of the emission. The theoretical results are shown to agree satisfactorily with observation, and it is concluded that the hydrogen-ozone reaction can adequately account for most of the observed features of the hydroxyl emission. Finally, the need to incorporate some form of molecular and eddy diffusion into the model is clearly indicated by the results. (Author abstract)##

01504

W. J. Hamming and J. E. Dickinson

CONTROL OF PHOTOCHEMICAL SMOG BY ALTERATION OF INITIAL REACTANT RATIOS. J. Air Pollution Assoc., 16(6):317-323, June 1966.

A study of the variation in eye irritation with irradiation time demonstrates that the time at which eye irritation measurements are taken is important in understanding the entire photochemical mechanism underlying the smog problem in the summer in Los Angeles. The data analyzed were obtained from 5 experimental studies conducted under a variety of conditions. Analysis of the data from chamber irradiation experiments indicate that eye

irritation is noted at the same time as the max. concentration of nitrogen dioxide. The chamber data have shown that the initial concentrations of the 2 principal reactant contaminants, hydrocarbons, oxides of nitrogen, and the relationship between them, must be considered in studying the production of eye irritation from photochemical smog. To determine how the initial reactant concentrations affect the degree of eye irritation which can be produced, the available data from several experimental studies were analyzed.##

01587

G.J. Doyle

MODEL AEROSOLS FOR ATMOSPHERIC SMOG. Stanford Research Inst., South Pasadena, Calif., Southern California. 1961. 18pp.

One model reaction for formation of aerosol in the atmosphere requires the presence of sulfur dioxide at fractions of a part per million in photoxidizing mixtures of olefin and nitrogen oxide at part per million concentrations. An experimental study of this type of reaction and the results to date are described, with particular emphasis on 2-methyl-2-butene as the olefin.##

01602

E.A. Schuck

THE NATURE OF EYE IRRITANTS IN SMOG. Stanford Research Inst., South Pasadena, South Pasadena, Southern California Labs. 1961. 8 pp.

Three ppm of individual hydrocarbons were mixed in pure air along with 1 ppm of nitric oxide or nitrogen dioxide. During the subsequent two hour irradiation with near-ultraviolet light the mixture was monitored with a long-path infrared spectrophotometer. The major products formed by photooxidizing many individual hydrocarbons were readily identified and their concentrations measured. In general, it was found that most olefins react rapidly and generate irritation while saturated hydrocarbons are relatively unreactive and do not result in irritating mixtures. In the absence of specific knowledge of the types and concentrations of the components of smog-producing atmospheres, control of olefins rather than oxides of nitrogen appears to be the more practical approach to control of eye irritation. The effect of control measures on eye irritation will be a function of several factors. Some of these factors are: the olefin-to-oxides of nitrogen concentration ratio; the type of olefin or olefin mixture involved; and the length of irradiation time and intensity of sunlight. To the extent that these auto exhaust mixtures are typical, it is concluded that ethylene and propylene are the most important precursors of eye irritation in such mixtures.##

C1610

G.M. Keating, J.A. Mullins, C.W. Coffee, D.S. McDougal

DETERMINATION OF MEAN ATMOSPHERIC DENSITIES FROM THE EXPLORER IX SATELLITE. National Aeronautics and Space Administration, Langley Station Hampton, Va., Langley Research Center. (REPT. NO. TN D-2895). JULY 1965. 35 PP.
CFSTI, NASA TN D2895

A method is developed for determining mean atmospheric densities from changes in the orbital elements of the Explorer IX (1961 Delta 1) Satellite, a 12-foot-diameter balloon. The decay of the total energy of the satellite orbiting about an oblate spheroid is evaluated and the energy change due to the work done by radiation force upon the satellite is subtracted to yield the energy decay attributed to atmospheric drag. The direct solar radiation force upon Explorer IX is determined from measured vectorial reflectance of the satellite material. Equations are given for the effective coefficient of drag of Explorer IX, and mean atmospheric densities at heights from 310 km to 765 km are tabulated for the entire lifetime of the satellite (February 1961 through March 1964) from changes in the orbital elements of Explorer IX. (Author summary)##

01640

M. Katz

SOME ASPECTS OF THE PHYSICAL AND CHEMICAL NATURE OF AIR POLLUTION. World Health Organization Monograph Ser. (Air Pollution). No. 46 1961. pp. 97-158.

This chapter of the WHO Monograph reviews works on air pollution accomplished within the last ten to 15 years. The subject of the physical and chemical nature of air pollution is so broad and covers many fields of physics, chemistry and medicine that only the most important works have been highlighted. Discussed among others were the following problems: The development of improved methods and techniques for the measurement, separation and identification of air contaminants, the standardization of methods of sampling and analysis of common air pollutants, the application of meteorological concepts and diffusion theory to the study of the dispersion of pollutants in the atmosphere, the formation of smog and the prediction of pollution levels, the development of improved analytical techniques, instrumentation and studies of motor vehicle exhaust gas composition under various operating conditions and the development of catalytic and other exhaust gas system control devices, the study of the action of sunlight on motor vehicle and traffic gas and of photochemical atmospheric reaction in general, the determination of the health and other effects of irradiated gaseous and vapour pollutants, the continued study of carcinogenic and other toxic substances presented in the urban environment and

the evaluation of their effects on health, and the study of radioactive pollutants and their effects in connection with the development of industrial uses of nuclear energy for power and transportation.##

01649

C. H. Nicol and J. G. Calvert

RELATIONS BETWEEN PHOTODECOMPOSITION MODES AND MOLECULAR STRUCTURE IN THE SERIES OF CARBONYL COMPOUNDS, N- C3H7COR. Preprint. (Presented in part at the Gordon Conference on Organic Photochemistry, Tilton, N.H., July 1965.)

The vapor phase photolysis of a series of carbonyl compounds of general structure n-C3H7COR was studied at 3130 A as a function of temperature and pressure. The R group was varied in the series, H, CH3, C2H5, n-C3H7, iso-C3H7, n-C4H9, iso-C4H9, sec-C4H9, tert-C4H9, in order to evaluate the effect of structure upon the individual primary photodissociative processes and the relationship between these processes. Quantum yields of carbon monoxide and ethylene products were used as measures of the type I (n-C3H7 COR + h nu yields n-C3H7CO + R and n-C3H7 + COR) and type II (n-C3H7COR + h nu yields C2H4 + CH2=C(OH)R primary photodissociative modes in the ketones. A number of correlations were noted between the structural features and the efficiency of the Type II rearrangement. One striking effect was the relation between phi II and the extent of alkyl substitution on the alpha-carbon atom of the R group. An empirical rule was formulated which relates molecular structure and the phi II values for the n-propyl ketones. (Author abstract)##

C1650

B. E. Saltzman , A. I. Coleman, and C. A. Clemons

HALOGENATED COMPOUNDS AS GASEOUS METEOROLOGICAL TRACERS: STABILITY AND ULTRASENSITIVE ANALYSIS BY GAS CHROMATOGRAPHY. Anal. Chem. 38, 753-8, May 1966.

Tracer compounds added to moving air masses are useful for demonstrating the transfer of pollutants from one local area or city to another. A study of gaseous compounds resulted in the selection of three suitable materials: sulfur hexafluoride, bromotrifluoromethane, and octafluorocyclobutane. These materials are non-toxic, are rare in the atmosphere, and can be readily dispersed from weighed tanks containing them in liquid form under pressure. An appropriate mixture can be employed if necessary to reduce possible errors caused by interfering emissions, and the components in air can be determined with high sensitivity in a single 10-minute run. An ultrasensitive gas chromatographic procedure with an electron-capture detector was developed which utilized carefully purified carrier gas and optimized

columns, detectors, and operating parameters. Sensitivity of 10 to the minus five power ppm was achieved for sulfur hexafluorid without concentration of the sample. Convenient procedures for sampling and calibration were established. Reactivities of these materials with ordinary atmospheric pollutants such as automobile exhaust, hydrogen sulfide, nitrogen dioxide, ozone, and sulfur dioxide were studied at various humidities, both with and without irradiation equivalent to sunlight. Good stability was indicated. Losses by washout due to rainfall appeared to be negligible. These techniques should be very useful both for tracing local emissions and for long-range meteorological studies of movement of air masses. (Author abstract)##

01675

E.R. Stephens

TEMPERATURE INVERSIONS AND THE TRAPPING OF AIR POLLUTANTS. Weatherwise 18, (4) 172-4, Aug. 1965

Author discusses the parameters in the lower atmosphere which contribute to the flow of atmospheric currents which results from solar heating of the earth's surface (photochemistry).##

01718

A. P. Altshuller and I. R. Cohen

PHOTO-OXIDATION OF ACROLEIN-NITROGEN OXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution. 7, 1043-9, 1963.

The photolysis of acrolein and the photo-oxidation of acrolein in the presence of oxygen have been investigated at high concentrations of acrolein. Both reactions have been reported to proceed very slowly when the ultraviolet radiation used is in the solar region (less than 2900 A). The present study was made of acrolein-nitrogen oxide mixtures in the ppm range when photooxidation is initiated by solar type radiation. The acrolein was varied between 1 and 12 ppm and the nitrogen dioxide or nitric oxide between 0 and 50 ppm with the reactants diluted in one atmosphere of air. The results are of interest as related to photochemical reactions in the atmosphere. (Author abstract)##

01752

G. I. Kouznetzon, and A. Kh. Khrgian

ATMOSPHERIC OZONE AND ITS VARIATIONS CONNECTED WITH CIRCULATION OVER THE ATLANTIC OCEAN. Atmosfernyi Ozon i Ego Izmeneniia,

Sviashchennyi s Tsirkuliatsiei nad Atlanticheskim Okeanom. Fiz. Atmos. i Okeana (Moscow) 2, (8) 859-71, Aug. 1966.

Atmospheric ozone determination and meteorological observations made during a voyage of the research ship "M. Lomonsov" to the South Atlantic and back during Aug.-Nov. 1963 are analyzed. Daily radiosonde and wind observations were also made. The amount of ozone in the atmosphere was highest in October when the ship was at the latitude of greatest solar radiation, south of the equator. An area approximately 10 degrees N and S of the equator had the minimum concentration of ozone. A decrease in atmospheric pressure usually resulted in an increase in ozone concentration, and vice versa. Ozone concentration increased in association with frontal weather, as indicated by analysis of data from several frontal situations. A decrease in the height of the tropopause was also associated with increased ozone content.##

01758

V. A. Bazhenov, R. N. Ivanova, and M. M. Miroshnikov

DETERMINATION OF THE MASS OF H2O, CO2, AND O3 IN VARIOUS ATMOSPHERIC LAYERS. Atmos Oceanic Phys. English translation 2, (3) 185-7, Mar. 1966.

A mathematical method for estimating the mass of H2O, CO2 and O3 in various atmospheric layers is given. The mass may be calculated easily if the zenith angle, z lies within the limits of 100 and 80 degrees. Otherwise, it is necessary to take into account the earth's curvature and refraction distortion using a nomogram devised by the authors. The vertical distribution of the concentration of the gases is assumed to be known. The mass of absorbing gas may be calculated from the following formula: Q equals A(sub H1)f(Z sub 1)-Q(sub H2)f(Z sub 2) where Q sub H is the mass of absorbing gas in a vertical column of the atmosphere for a height H to infinity; f(Z) is a function describing the dependence of the mass of absorbing gas on the zenith angle. The function f(Z) may be determined by an empirical formula. Altschuler's graphical method may be used for calculating the quantity of absorbing gas in the vertical direction.##

01825

S. L. Kopczynski

PHOTO-OXIDATION OF ALKYLBENZENE-NITROGEN DIOXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution. 8, 107-20, 1964.

Measurements of the relative reaction rates of various alkylbenzenes in photo-oxidative reactions with NO2 in the air

are reported. The reaction rates are compared with the relative basicities of the compounds. A partial analysis of the gas phase and condensed phase products is also reported. It appears that as much as 50 per cent of the reacted carbon atoms may be contained in the condensed phase. The several irradiation and analytical techniques employed are compared. The photo-oxidation reactions of olefins and alkylbenzenes are compared. Free radical chains appear to play a more important role in the photo-oxidation reaction rates of certain alkylbenzenes than in the reaction rates of olefins. Hyperconjugative interaction of the methyl groups with the aromatic ring is proposed as a possible explanation of the order of reactivity of various isomers of the methylsubstituted benzenes. (Author abstract)##

01828

A. P. Altshuller, G. C. Ortman, B. E. Saltzman, and B. E. Neligan

CONTINUOUS MONITORING OF METHANE AND OTHER HYDROCARBONS IN URBAN. J. Air Pollution Control Assoc. 16, (2) 87-91, Feb. 1966.

Continuous measurements of total hydrocarbons (and other organic substances) and of methane were made in Cincinnati and Los Angeles for three-month periods. Some of the measurements were made during episodes of photochemical air pollution. Two instruments, one for measurement of total hydrocarbons and the other for methane, were operated in parallel. Both incorporated flame ionization detectors having greater sensitivity than commercial flame ionization instruments. The flame ionization analysis for methane was made specific by use of an adsorbent carbon column preceding the analyzer to retain all organic substances except methane. Subtracting the methane concentration values from those for total hydrocarbons gave nonmethane hydrocarbon concentrations. The data showed diurnal patterns of concentrations of methane and nonmethane hydrocarbons in the atmosphere. Average hourly values for methane were strikingly similar in Los Angeles and in Cincinnati (2.6 and 2.4 ppm, respectively); those for nonmethane hydrocarbons were four times as high in Los Angeles (3.0 and 0.8 ppm, respectively). A bimodal frequency distribution pattern of the concentrations suggested that atmospheric ventilation was either good or poor, with less than a random amount of time in intermediate stages. The width of the methane frequency distribution peak was about half the width of that for nonmethane hydrocarbons, indicating a different and more constant source for the former. (Author abstract)##

01984

A. P. Altshuller and I. R. Cohen

STRUCTURAL EFFECTS ON THE RATE OF NITROGEN DIOXIDE FORMATION IN THE PHOTO-OXIDATION OF ORGANIC COMPOUND-NITRIC OXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution, 7, 787-97, 1963.

The rapid conversion of nitric oxide to nitrogen dioxide occurs in the presence of certain organic species and of ultraviolet radiation below 4000 A. The reaction is an important and critical step in the over-all reactions of organic compound-nitric oxide photochemical systems. These systems in turn are an important part of the reaction complex associated with the photochemically initiated type of air pollution. The eye irritation and plant damage effects found in photo-chemical "smog" have been simulated by the irradiation of certain hydrocarbon-nitrogen oxide systems (Leighton, 1961). Until recently the available experimental data on the photochemically initiated conversion of nitric oxide to nitrogen dioxide has been restricted almost entirely to work on olefinic hydrocarbons including isobutene, trans-2-butene, and 1,3-butadiene (Leighton, 1961; Tuesday, 1961). Recently, preliminary work has been reported on other organic species including the aromatic hydrocarbons (Altshuller et al. 1962a). It was shown that a number of dimethyl and trimethylbenzenes participate in this reaction about as effectively as do the 1-alkenes and appreciably more rapidly than tehylene. In the present work this study is extended to additional aromatic hydrocarbons, aldehydes, ketones, paraffinic hydrocarbons, and alcohols. Analyses for oxidant concentrations have been made on some of the systems studied. Some data have been obtained on the formation of aliphatic aldehydes in the reactions of aromatic hydrocarbon-nitric oxide systems. (Author abstract) ##

02201

A.B. Pittock

A THIN STABLE LAYER OF ANOMALOUS OZONE AND DUST CONTENT. J. Atmospheric Sci. 23, (5) 538-42, Sept. 1966.

Coincident observations of a layer of volcanic material and a sharp minimum in the vertical distribution of ozone over Boulder, Colo. (40N), are presented and discussed. The ozone minimum was observed at an altitude of 20-21 km for a month during the spring of 1964. Quasihorizontal advection of a thin stable layer of tropical air into which volcanic debris was injected when Mt. Agung (8S) erupted on 17 March 1963 is thought to be responsible. The layer is characterized by a "quasi-vertical" eddy diffusion coefficient less than or equal to 250 sq cm/sec. Significant destruction of ozone by the volcanic debris is not indicated. (Author abstract) ##

02268

R. T. H. Collis

CLEAR AIR TURBULENCE DETECTION. IEEE (Inst. Elec. Electron. Engrs.) Spectrum 3, (4) 56-61, Apr. 1966.

Although it is difficult to describe the nature of clear air turbulence (or CAT), its effect is known as the sudden vibration experienced by an aircraft in flight in a stormfree, cloudfree sky. It is evident that this turbulence is an eddy motion of the air

that disrupts its uniform flow, a motion such as that associated with jet streams; however, it is not known exactly how it is generated. Because the effects of CAT can range from passenger discomfort to actual loss of an air-craft, it is important to devise some method of warning the pilot of turbulent areas to be avoided. Various indirect and direct detection systems, employing both active and passive techniques, are currently being investigated, but thus far all have exhibited serious limitations on effective performance. One reason for this is the lack of data concerning the phenomenon they are designed to detect. (Author abstract)##

02285

A.J. Drummond

TECHNIQUES FOR THE MEASUREMENT OF SOLAR AND TERRESTRIAL RADIATION FLUXES IN PLANT BIOLOGICAL RESEARCH: A REVIEW WITH SPECIAL REFERENCE TO THE ARID ZONES. Proc. Montpellier Symp.: Methodology of Plant Ecophysiology 13-27, 1965.

It is clear that although individual specialized measurements of radiative transfer in the vicinity of plants, etc., must be afforded every encouragement, the main body of radiation material upon which the biologist and his associates must depend has to be provided in the generalized patterns, laid down by international agreement, for the network stations of the official meteorological organizations. This article presents a modern view of the techniques and their capabilities, for such standard measurements, and of possible modification from the threshold of plant physiological studies in arid locations.##

02305

F. Pooler, Jr.

THE AIR OVER CITIES. Bull. Am. Meteorol. Soc. 438 (6) 234-7, June 1962.

This paper reviews the symposium of the same title, held 1961 in Cincinnati, Ohio, which was attended by meteorologists and other interested persons. Papers presented in following sections are briefly discussed: Weather, climate and air pollution in urban areas; Dispersion and deposition of air pollutants over cities; Present and future needs for meteorological and air quality observations.##

02344

G. B. Spindler.

OBSERVATIONS ON THE RELEASE OF NITRIC OXIDE IN THE E-REGION. PLANETARY SPACE SCI. 14, 53-64, 1966.
CFSTI AD 632867

Observations on four nitric oxide releases in the E-region are described. As a result of these observations, some changes are suggested in the current kinetic theory of the NO-O reaction, and a reaction model is presented. It is proposed that the NO-O reaction, at least at E-region pressures, is bimolecular, and, in line with the findings of other experimenters, that the effective rate constant there may be faster than the value obtained for this reaction in the laboratory. Relative atomic oxygen profiles for two different latitudes are presented as well as evidence for a latitude effect on the profiles. The atitude at which atmospheric flow changes from turbulent to laminar is also different at these two latitudes. It is probably that atomic oxygen concentration drops sharply below 80 km, but above the peak of the profile, concentration falls with a first decadis scale height of 14 km, in agreement with photochemical theory. Observations on the wind-distorted luminous trail show a relatively strong wind shear present in each case near 100 km. (Author abstract)##

02352

J.J. Bufalini A.P. Altshuller

SYNERGISTIC EFFECTS IN THE PHOTOOXIDATION OF MIXED HYDROCARBONS. Environ. Sci. Technol. 1, (2) 133-8, Feb. 1967.

Since there is considerable disagreement in the published values for rate constants for olefin-atomic oxygen and olefin-ozone reactions, the reality of the so-called excess rate has been questioned. If the excess rate is not real, then the rate of oxidation of a given olefin should depend only on light intensity and NO2 concentration. If a second olefin of different reactivity is added to a given olefin, then no effect other than the influence of different O-atom and ozone concentrations should be observed on the given olefin and the hypothesis that the principal mode of disappearance of olefins is due to O-atom and ozone reactions is correct. As a test of this hypothesis, 1-butene was irradiated at three light intensities with NO2, both alone and in the presence of trans-2-butene and 1,3,5-trimethylbenzene separately. Synergistic effects were observed that could not be explained by O-atom and ozone reacrions alone. (Author abstract)##

02359

S.L. Kopczynski A.P. Altshuller

PHOTOCHEMICAL REACTIONS OF HYDROCARBONS WITH SULFUR DIOXIDE. Intern. J. Air Water Pollution, 6, 133-135, 1962

Gas mixtures of SO2 and hydrocarbons n-butane, isobutane, neopentane, 3-methyl-1-butene irradiated by either a mercury arc or sunlamp, produced appreciable quantities of condensate on the walls of the experimental flasks. A carbonyl band was present at 5.7 microns. In several experiments with isobutane as the hydrocarbon, a strong band at 5.7 microns was observed along with other IR bands assigned to the acetone molecule. A set of 3 strong bands in the 9.5 to 10 micron

region characteristic of methanol was observed also. At 1 mm partial pressure of SO2 and n-butane or isobutane, a slight film of condensate could be observed when the Hg arc was used, but not when the sunlamp orovided the UV radiation. Acetone and methanol were indicated by spectral data on the more dilute mixtures. At concentrations of 0.05 to 0.1 mm, no film could be detected from SO2 and isobutane or 1-pentene mixtures irradiated by sunlamp; with the Hg lamp only weak IR bands could be obtained after 20 hours. Evidence indicates that photooxidation of SO2 in the presence of saturated hydrocarbon at concentrations found in the atmosphere does not significantly contribute to formation of aerosols in air pollution situations in comparison with aerosol results from other reactions involving SO2 in combination with NO and olefins.##

02360

G.C. Holzworth J.A. Mags

THE VISIBILITY TREND IN THE CENTRAL VALLEY OF CALIFORNIA.
Preprint. 1960

A method of analysis has been introduced for the treatment of visibility trends. This method is based on the assumption that with a trend of deteriorating visibility, the resultant changes (with time) in the percent frequencies of visibilities in given ranges shift downward to each next lower range of visibility. A relationship between wind speed and visibility indicates that with intermediate speeds there is a smaller percent frequency of poor visibilities than with both higher and lower wind speeds. This is interpreted as due to dusts becoming air borne at wind speeds, and atmospheric dispersion of pollutants being reduced at lower wind speeds.##

02458L

J.S. Randhawa

OZONE MEASUREMENTS WITH ROCKET-BORNE OZONESONDES.
White Sands Missile Range, N. Mex., Atmospheric Sciences LAB., (REPT. ECOM-5039) PP. 22, 1966.
DDC AD 482328

A rocket-borne ozonesonde has been developed which utilizes the chemiluminescent principle for the measurement of the ozone concentration in the atmosphere. This has been fired with the ARCAS rocket at White Sands Missile Range, New Mexico. The instrument, as it descends with the parachute, measures the ozone concentration. In addition to the main peak ozone concentration generally gound near 22km, a secondary peak has been observed close to 40 kilometers. A gross detailed structure of ozone distribution in the upper stratosphere has been measured which could not be obtained by the Umkehr method. 7Author abstract)##

02465

P.R. Sticksel

THE VERTICAL DISTRIBUTION OF OZONE OVER TALLAHASSEE, FLORIDA (SCIENTIFIC REPT. NO. 1). Florida State Univ., Tallahassee, Dept. of Meteorology. (Rept. 66-3) (Rept. AFCRL-66-351) June 15, 1966. 155 pp.

Between January, 1963, and February, 1965, 158 Regener chemiluminescent ozonesondes were launched from Tallahassee, Florida, (30.5 degrees N, 84 degrees W), as part of a three-year synoptic sounding program for the investigation of the vertical distribution of ozone over North America. These ozonesonde flights consisted of regular flights at one week intervals, several series of daily and bi-daily flights and a number of unscheduled flights at irregular intervals. In general, there was a single maximum of ozone density located near 23 km above Tallahassee throughout the year. The increase to this maximum betan at the tropical tropopause and at least 80 per cent of the total amount of ozone was located above this tropopause. Relative maxima below this level occurred during the first half of the year and their appearance could be related to the presence of the subtropical jet stream south of Tallahassee and to the horizontal movement of "ozo clouds" within the layer between the tropical and subtropical tropopauses. The formation process of these secondary maxima was investigated by constructing isentropic trajectories to trace the movements of the maxima. An inquiry into the cause of a 40 per cent variation of total ozone during a 10-day period indicated that it resulted primarily from horizontal and vertical motions between 16 and 24 km and secondarily from horizontal advection between 12 and 16 km. In both layers these processes were found to be under the control of middle latitude circulation systems. The procedures followed at the Tallahassee station and the performance record of the ozonesonde flights made during this period are also discussed. (Author abstract) ##

02476

E. R. Stephens.

REACTIONS OF OXYGEN ATOMS AND OZONE IN AIR POLLUTION. Intern. J. Air Water Pollution 10, 649-63, Oct. 1966 (Presented at the Symposium on Photochemical Aspects of Air Pollution, Cincinnati, Ohio, April 1965.)

The reactions of free oxygen atoms and ozone as they apply to air pollution and the factors which govern the oxygen atom and ozone concentrations are reviewed. The role played by reactions of oxygen atoms with oxides of nitrogen is discussed as it affects the determination of light intensity by photolysis of nitrogen dioxide. The realtionship of these inorganic reactions to the attack on hydrocarbon molecules is discussed along with the various attempts which have been made to account for the rate of disappearance of

hydrocarobon in terms of its reactions with oxygen atoms and ozone. Since most of these attempts have indicated that these two reactions fall short of accounting for the observed rate of reaction, it has been suggested that free radical attack may play a role. Some difficulties with this concept are pointed out. Experiments on the reaction of olefins with ozone have produced discordant results and are discussed. (Author abstract modified)#

02524

P. L. Boney

ON THE INFLUENCE OF WATER VAPOR ON THE DISTRIBUTION OF STRATOSPHERIC OZONE. J. Atmospheric Tereest. Phys. 27, 1177-90, 1965.
CFSTI, DDC: AD 632871

Using the chemical mechanism proposed by Hampson for the formation of the ozone layer in the presence of stratospheric water vapour, it is suggested that the latitudinal and seasonal distribution of total ozone concentration may be explained as readily by the controlling effect of water vapour as by circulatory mass motions. Water vapour catalytically reduces lower stratospheric ozone, and, on the assumption that the stratosphere is much wetter at the equator than at the poles, it is possible to account for the higher total ozone content at the poles above that at the equator. An apparent seasonal variation of water vapour content in the tropics would then be in accord with complementary seasonal variations of total ozone content .* (Author abstract)##

C2677

J. Joubert, R. Fontanges, J.M. Guerne, L. Colcrbert, Ch. Eyraud

INVESTIGATIONS ON THE ACCUMULATION OF MICROORGANISMS IN IONIZING FIELDS. Staub (English Translation) 25, (8) 11-7, AUG. 1965.
CFSTI TT 66-51040/8

Theoretical and experimental investigations into the accumulation of microorganisms in an ionizing field have shown that the paths are determined by electric charges acquired by micro-organisms under the effect of ion bombardment and thermal ion diffusion. In the case of elliptical or cylindrical micro-organisms the thermal ion diffusion may, in general, be disregarded. The viability of numerous types of these organisms is changed in passing through an ionizing field. It appears that ozone has no harmful effect. It is evident that it is difficult to distinguish to what extent the harmful effect is due to ions, electrons and photons. In contrast to this the resistance of some types of bacteria is remarkable. (Author summary)##

02777

A. P. Altshuller, I. R. Cohen, and T. C. Purcell

PHOTOOXIDATION OF HYDROCARBONS IN THE PRESENCE OF ALIPHATIC AIDEHYDES. Science 156 (3777), 937-9, (May 19, 1967). 1966.

A new group of gas-phase reactions has been shown to contribute to the photooxidation of hydrocarbons. The photooxidation of aliphatic aldehydes in the part-per-million range at wavelengths below 3400 A produces intermediates that react with olefinic and aromatic hydrocarbons. The reactions have been investigated with laboratory ultraviolet radiation sources and solar radiation. Although the reaction rates are slower than those associated with the corresponding nitrogen oxide induced photooxidations, the rates are significant in terms of the time scale of interest in urban atmospheric reactions. These results may cause modifications of current considerations of whether control of nitrogen oxides will effectively reduce photochemical air pollution. (Author abstract) ##

C2869L

A.L. Berlad

PHOTOCHEMICAL PROCESSES IN EXPLOSION OF OZONE. Defense Research Corp., Santa Barbara, Calif. (Rept. Nos. AFRPL-TR-66-129) 15 PP., JUNE 1966.
DDC AD 483589

Examination is made of chemical kinetic schemes proposed for the thermal and photoinitiated decomposition rates of ozone. A kinetic scheme capable of representing both the observed ultraviolet quantum yields in pure ozone and the thermal decomposition rates in 03-02 mixtures is selected. The scheme is intended for calculation of temperature-composition histories during photoinitiated ozone explosions. Such calculations are now in progress. Preliminary results indicate a close correspondence between the calculated results and the observed explosive behavior of 03 under photolysis. Application is also planned for calculation of photochemical steady-states in ozone, and their relation to explosion limits. (Author abstract) ##

02938

M. Neiburger

WEATHER MODIFICATION AND SMOG. Science 126, (3275) 637-45, Oct. 4, 1957. (Presented at the Technical Conference, Inst. of Geophysics, Nov. 1956.)

The 3 essential ingredients in the Los Angeles type of smog are:

(1) Sources emitting pollution into the air; (2) atmospheric conditions which deter or prevent rapid transport of these pollutants in the atmosphere; and (3) solar radiation for the photochemical reactions which transform the relatively innocuous pollutants into substances which cause irritation to the eyes and the respiratory tract and damage to plants. In this article, the various proposals for modifying the weather in order to eliminate smog are discussed. Elimination of smog by weather modification is more difficult or costly than control at the sources. Proposals for meteorological modification are ordinarily aimed at increasing the volume into which the contaminants may spread, either by raising or eliminating the inversion or by causing the air to move more rapidly across the basin. Methods have been proposed for reducing the solar radiation below the level required for photochemical reactions. Only a completely new and unique approach to weather modification could have any hope of success in eliminating or ameliorating smog. It is reasonable for the agencies concerned with the solution of the problem to devote their efforts to the detection and control of the sources of pollutants responsible for the obnoxious and deleterious effects of smog.##

03022

R.S. Narcisi, R.A. Langley, H.A. Cohen, J.E. Elwell

BALLOON-BORNE MASS SPECTROMETER MEASUREMENTS OF THE CONSTITUENTS OF THE ATMOSPHERE TO 28 KILOMETERS. Air Force Cambridge Research Labs., L.G. Hanscom Field, Mass., Upper Atmosphere Physics Lab. (Rept. No. AFCRL-66-339) 31 pp., May 1966

To determine the feasibility of making mass spectrometric measurements of the lower atmosphere, balloon flights have been made to an altitude of 28 km with a time-of-flight mass spectrometer. Composition measurements were obtained, and some of the problems of extending the range and accuracy of measurements resolved. (Author abstract)##

03064

Cadle, R. D. and J. W. Powers

SOME ASPECTS OF ATMOSPHERIC CHEMICAL REACTIONS OF ATOMIC OXYGEN. Tellus (Uppsala), 18(2):176-186, 1966. 44 refs.

Some features of atmospheric atomic oxygen chemistry that have received little attention, that need to be re-evaluated in the light of recent data, that have been studied in the author's laboratory, or that encompass some combination of these three are discussed. Newly-calculated values for the concentrations of excited atomic oxygen below 100 km are so low that it is unlikely that its reactions contribute appreciably to the concentration of

any atmospheric component in that region with the possible exception of excited molecular oxygen. Reactions of ground state atomic oxygen may constitute a sink for methane and a source of sulfate in this atmospheric region. Many chemionization reactions probably occur in the atmosphere, and three possible types are considered in detail. (Author abstract)##

03068

G. C. Holzworth and C. R. N. Rao

STUDIES OF SKYLIGHT POLARIZATION. J. Opt. Soc. Am. 55, (4) 403-8, Apr. 1965. (Presented in part at the Fall Meeting, Optical Society of America, Chicago, Ill., Oct. 23-25, 1963.)

The results of a series of systematic measurements of skylight polarization are presented and discussed. The measurements were made at Los Angeles during spring, 1963. A photoelectric skylight polarimeter employing ac light modulation was employed in these measurements which were confined to the plane of the sun's vertical. Three spectral intervals (bandwidth about 150 A) centered around 4000, 5100, and 6000 A were studied. An attempt was made to account for the departure of location and dispersion of the neutral points and the polarization maximum from the computed values for a purely molecular atmosphere in terms of the local turbidity. The effect of the variable reflectance of the ground on the magnitude of the polarization maxima was included in these studies. (Author abstract)##

03102

E.K. Kauper C.J. Hopper

THE UTILIZATION OF OPTIMUM METEOROLOGICAL CONDITIONS FOR THE REDUCTION OF LOS ANGELES AUTOMOTIVE POLLUTION. J. Air Pollution Control Assoc. 15, (5) 210-3, May 1965

Advantage can be taken of optimum conditions of turbulent mixing to decrease the intensity of automobile-caused pollution in the Los Angeles Basin. Changing the summertime peak traffic hours--will result in an improvement of 24 percent for an eight-hour day, in terms of oxidant concentrations. Greater improvements (up to 54 percent) are possible by use of seven or six-hour days, should they be found to be economically feasible. (Author abstract)##

03133

J. M. Rosen

THE VERTICAL DISTRIBUTION OF DUST (ANNUAL PROGRESS REPT.).

Minnesota Univ., Minneapolis, School of Physics. June 1966. PP. 37-41.
CFSTI, DDC AD 636593

The first flight data obtained with the coincidence dust counter is a good illustration of the layered character of the stratosphere. The region between the tropopause and the O3 maximum is frequently characterized by dust and O3 rivers. On this sounding the data show good correspondence between the two lower dust and O3 peaks. At 19.5 km however, there is an O3 river but no corresponding dust river. This observation can be understood by referring to the lines of constant mixing ratio on the sounding. Since the mixing ratio of a trace constitutent is preserved in vertical displacements a river will not appear in a sounding for that constituent in a region where the mixing ratio is constant with altitude. The river in this case is in a location where the dust follows a constant mixing ratio with altitude but the O3 does not. Thus, only the O3 profile should show the river. Above the R3 maximum where both the dust and O3 mixing ratio is constant with altitude, a river cannot be observed in a sounding for these constituents. A casual inspection of the dust and O3 layers at about 17 km would suggest that it is also a river , but upon closer examination a number of peculiarities appear normally not associated with rivers. First, the dust layer is about 1 km lower than the O3 layer, Second, the mixing ratio of dust in this layer is greater than at any point in the atmosphere above it. In addition, the size distribution in this layer is considerably different from that of the surrounding atmosphere. It may be possible that the layer at 17 km is connected with radioactive debris. The dust distribution above 17 km is characterized by layers in which the mixing ratio is constant with altitude but discontinuous at the boundaries. Another peculiar layer appears at 26 km. The size distribution in this layer is extremely different from the surrounding atmosphere. This layer is also marked in the O3 by a change in the profile structure, not by a change in concentration.##

03188

INFORMATIONAL FACTORS INFLUENCING HIGHWAY SAFETY - VISIBILITY (PART II OF THE STATE OF THE ART OF TRAFFIC SAFETY - A CRITICAL REVIEW AND ANALYSIS OF THE TECHNICAL INFORMATION ON FACTORS AFFECTING TRAFFIC SAFETY). Little (Arthur D.), Inc., Cambridge, Mass. June 1966. pp. 149-57.

Given a physically unobstructed view of the roadway and the illumination necessary to see it, there are a number of factors both natural and manmade which affect the driver's ability to perceive the roadway and his intended path. Meteorological factors such as fog, rain, snow, and dust can interfere with such perception. In a study of road accidents in the Melbourne, Australia, metropolitan area it was found that fog, mist, haze, and smoke, which are rather frequent weather phenomena in the Melbourne area, were accompanied by reductions in the casualty accidents. The author attributed this accident reduction, in

spite of a greater specific hazard of accidents, to safer driving practices during these atmospheric conditions. These findings on fog and haze are at variance with measurements made in the Stuttgart, Germany, area which showed 4% increase in accident numbers during fog conditions. The State of California Highway Transportation Agency has reported (1965) on a study of reduced visibility in fog conditions based on an analysis of 1961 and 1962 accidents in the State of California. Something less than 0.2% of all accidents are classified as multiple vehicle fog accidents during this period, but the authors note that many accidents have been coded as fog on the accident report, when actually the visibility due to the fog was not limiting to the driver. However, fog is believed to be a leading factor in multiple (four or more vehicle) accidents and fatalities. In the period examined, 17.3% of the multiple vehicle accidents and 35.7% of the multiple vehicle fatalities occurred under fog conditions. The study concludes that the fog itself produces a response from the driver in terms of the speed he uses in driving rhough the fog. In general the literature on the subject of visibility is not complete enough to shed much light on visibility as a factor affecting accident rates. Of the various visibility factors considered the subject of illumination appeared to be the best studied. With regard to the factors of visual clutter, glare, weather effects, and other visibility modifiers the evidence presented in the literature is adequate for a qualitative appreciation of the nature of the influence of these factors but inadequate for a quantitative assessment of the contribution of each to the hazards of the highway transportation system.##

03342

H. Dolezalek and A. L. Oster.

SPECTROMETER FOR ATMOSPHERIC IONS IN THEIR UPPERMOST RANGE OF MOBILITY (PROJECT: MEASURING IONIC MOBILITIES IN THE TERRESTRIAL UPPER STRATOSPHERE AND MESOPHERE - PHASE I). Avoc Corp., Wilmington, Mass., Research and Advanced Development Division. (Rept. No. RAD-TR-65-25.) Sept. 4, 1965. 186 PP.
CFSTI, DDC 638 761

In the past, the mobility of atmospheric ions and the number density in different mobility ranges (ion spectrum) have been measured in the terrestrial atmosphere in the heights from ground to about 5 km. Electric conductivities of the atmosphere have been measured up to about 30 km and ion number densities to about 75 km. To extend the possibility of ion spectrum measurements up to the same height, a new method has been developed and tested in the laboratory. Its application in the free atmosphere is being prepared. The instrument may be used in planetarian atmospheres. The method consists of a GERDIEN-type "differential ion counter of the second order, "which provides a predetermined location of ion intake and a number of separate receiving electrodes for the ion impact. The driving voltage is ac; its amplitude is increasing downstream in the chamber. A low-pressure wind tunnel for continuous operation, mostly in the subsonic range, has been developed and constructed for the laboratory experiments.

This tunnel and its possible applications for other purposes are discussed. An outline of the theory of the different GERDIEN type ion counters is communicated. The laboratory experiments are described, and ion spectrums obtained in the low-pressure wind tunnel are presented. (Author abstract)##

03373

H. E. Landsberg, "Chairman."

CITY AIR - BETTER OR WORSE? Air Over Cities Symp., Cincinnati, Ohio, 1961. pp. 1-22.
HEW A 62-5

Human activity has caused considerable changes in local climates. These modifications in turn have affected the temperatures of the lowest layer of the atmosphere, the diurnal temperature range, the shape of the diurnal temperature curve, the local relative humidity, the local electric field, the patterns and amounts of precipitation, and the speed and direction of winds. These effects have probably only minor influence upon human wellbeing. Other changes, however, have potentially harmful effects. The most radical effect has been on atmospheric suspensions and admixtures. None of these changes have been beneficial. The growth of nearly all urban areas and industrial complexes has out-paced the engineering and legal efforts to minimize the nuisance and the possible dangers of contamination. Already the ill winds from one settlement can influence the next town downwind. The day of planning in terms of single communities is over, and whole regional patterns now must be viewed together. Knowledge of air quality and its effects on health is not yet adequate. n the interest of public hygiene an intense effort in biometeorological and medical research is required. (Author summary)##

03381

M. Neiberger, "Chairman."

THE DISPERSION AND DEPOSITION OF AIR POLLUTANTS OVER CITIES. (Air Over Cities Symp., Cincinnati, Ohio, 1961.) pp. 155-71.
HEW A 62-5

In setting limits for the control of pollution sources in industrial and urban complexes, limits must not be established solely on the basis of individual stacks and plants; the basic concept must be the area-source strength, in terms of total emissions per square mile, since the emissions from separate stacks and plants are additive as the air moves across them toward residential and commercial communities. The dispersion of pollutants from vehicle exhaust along congested streets and roads deserves attention. Such questions as the influence of heat from motor and the motion of the vehicles need examination. Studies of dispersion have generally assumed flat uniform terrain and wind conditions in which the direction is steady and the average speed is high compared to turbulent

fluctuations. Studies must be performed on the dispersion of pollutants over an irregular somplex of buildings and under the influence of wind conditions in which the average speed is low and the magnitude of windspeeds in fluctuations is as great or greater. (Author summary)##

03382

F.V.Brock

ANALOG COMPUTING TECHNIQUES APPLIED TO ATMOSPHERIC DIFFUSION: CONTINUOUS AREA SOUNCE. Air Over Cities Symp., Cincinnati, OHIO, 1961. PP. 173-88.
HEW A 62-5

An electronic analog computer has been used to obtain solutions ot the diffusion equation. The model is that of a continuous area source located on the ground in steady-state conditions. The crosswind-integrated concentration is obtained as a continuous function of distance downwind for discrete height intervals. The versatility of analog simulation is demonstrated by introducing a variety of boundary conditions and other parameters into the basic model. With this approach the effects of an inversion, radioactive decay, gravitational settling, ground reflection, ground absorption, etc. are conveniently included. Windspeed and eddy diffusivity can be arbitrarily caried with height. Analog simulation may be extended to treat the problem of photochemical reactions that occur during the diffusion process. (Author summary)##

03386

E. Robinson

THE RELATIVE IMPORTANCE OF SOME METEOROLOGICAL FACTORS IN URBAN AIR POLLUTION. Air Over Cities Symp., Cincinnati, Ohio, 1961. pp. 229-38.

Wind patterns and inversions or stability conditions are important meteorological factors affecting urban air pollution. Popular attention is usually focused on inversion, even though wind conditions can be shown to be more significant in many situations. The relative importance of winds and inversions is examined in terms of theoretical, statistical, and climatological considerations. (Author summary)##

03558

AEROSOLS--THEIR COMPLEX ROLE IN RAINFALL. NCAR Quart. (9) 1-5, Jan. 1965.

Theories concerned with one of the major roles of aerosols, that of nucleation of water droplets and ice crystals in cloud-forming and precipitation processes, are reviewed. Size and concentration are important factors in the cloud formation and subsequent rainfall. It has been established that the concentration of cloud nuclei in a given area is a dominant factor in the determination of the microstructure of a cloud. Freezing nuclei are unlike cloud nuclei in that they are insoluble and possess areas of wettability; in size they are considered to be similar, i.e., in the 0.1 - 1 micron range. There appears to be a difference between the activity of silver iodide and organic nuclei in bringing about ice formation. It is thought that the silver iodide particle may have hydrophilic areas, although it is basically hydrophobic, since photo-dissociation in certain areas of the particle may take place. On the other hand, the organic particles are believed to collide with water droplets in the nucleation process. Various other theories of the nucleation processes which are under investigation are mentioned as well as some pertaining to the origin of nucleation particles.##

03649

W. Warmbt

SURFACE OZONE AND ARTIFICIAL BETA ACTIVITY IN DRESDEN-WAHNSDORF.
Tellus (Uppsala) 18, (2-3) 441-9, 1966.

In the German Democratic Republic ozone and radioactivity networks at 5 stations, simultaneous measurements of surface ozone were made by the chemical method of Cauer and of artificial activity by filter sampling. The daily maximum values of surface ozone and the daily mean of radioactivity show relations in their seasonal trend. The results of these investigations at Dresden-Wahnsdorf station (51.1 degree N, 13.8 degree E) are discussed. In years without nuclear tests (1963 and 1964) there was a statistically significant positive correlation between ozone and radioactivity from March until September. In a year with fresh fission production (1962) there was such a correlation during the time of decreasing activity from June until August. From October until February the correlation in the years 1962 to 1964 was mostly negative, in part statistically insignificant. The relation of ozone and radioactivity data for large-scale weather systems and during periods with and without precipitation was investigated for daily deviations of ozone and radioactivity from their seasonal trend, smoothed by overlapping ten-day averages. From March until September there are deviations from the seasonal trend for both ozone and radioactivity From October until February there is an inverse trend due to the influence of large-scale weather systems with a stable stratification (central high pressure systems). Ozone decreases due to the accumulation of reducing trace constituents in surface air, while radioactivity decreases due to the increased rate of scavenging by dust. (Author summary modified)##

03650

K. G. Bohra, N. C. Subbaramu, and A. N. Mohan Rao

A STUDY OF THE MECHANISM OF FORMATION OF RADON DAUGHTER AEROSOLS. Tellus (Uppsala) 18, (2-3) 672-8, 1966.

The formation of radon daughter aerosols in air is found to be markedly influenced by the presence of charges and vapours. Experiments have been carried out with natural radon in the air to show that radon daughter products behave as single ions of high mobility in filtered dry air whereas they are attached to cluster aerosols formed in the presence of certain charges and vapours. In these experiments the cluster aerosols have been formed with ethanol vapour in the presence of small negative ions. Knowledge of this mechanism of attachment of radon daughters to cluster aerosols has also been used for the estimation of airborne radon. The radioactivity of these aerosols is studied by filtration through membrane filters. The degree of equilibrium between radon and its daughters in atmospheric air has been studied on the basis of this mechanism. The mechanism is of fundamental importance in understanding the nature of radon daughter products in the air under different environmental conditions. (Author summary)##

03657

J. W. Winchester and R. A. Duce

COHERENCE OF IODINE AND BROMINE IN THE ATMOSPHERE OF HAWAII, NORTHERN ALASKA, AND MASSACHUSETTS. Tellus (Uppsala) 18(2-3):287-91, 1966.

Previous reported analyses of rain, snow, aerosols, and gas from Hawaii, Alaska, and Massachusetts, and new analyses of Antarctic and Alaska snow and ice, are compared. Both I and Br appear to be associated with aerosols of smaller particle sizes and longer residence times than Cl-rich aerosols. In most suites of samples there is a clustering at I/Br about 0.1-0.2, and Br/Cl exceeded the sea water ratio (0.0034) several-fold . Aerosols collected over open sea water in Hawaii, however, show Br/Cl several-fold lower than in sea water. The latter particles are identified as "sea salt" aerosols whereas the Br-rich aerosols are smaller in size and may be basically different in composition, e.g. ammonium sulfate as discussed by JUNGE (1963). It is suggested that Br is "distilled" from the sea spray droplets, possibly by photochemical oxidation to Br2, and then "condensed" onto the smaller particles, possibly by participating in the oxidation of SO2 to sulfate. Iodine may engage in similar reactions, and the resulting I and Br-rich particles exhibit a world-wide constancy in I/Br. Precipitation analyses show a similar constancy in I/Br. (Author summary)##

03717

G. M. B. Dobson

SOME METEOROLOGICAL ASPECTS OF ATMOSPHERIC POLLUTION. Quart. J. Roy. Meteorol. Soc. 74, (320) 133-43, Apr. 1948. (Presented before the Royal Meteorological Society, Jan. 21, 1948.)

The relationship between meteorological conditions and air pollution is examined. Among the points covered are: movement of smoke and SO2 in the atmosphere; loss of daylight; convection, temperature gradients and inversion; and formation of fog.##

03777

F. E. Gartrell, F. W. Thomas, S. E. Carpenter, F. Pooler, B. Turner, and J. M. Leavitt

FULL SCALE STUDY OF DISPERSION OF STACK GASES (PART IV. COROLLARY STUDIES OF SO2 OXIDATION). Tennessee Valley Authority, Chattanooga, Div. of Health and Safety and Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. June 1965. 56 pp.

While the primary objective was determination of the extent of oxidation of SO2 in a power plant plume, initial investigation under semi-controlled conditions at ground level was considered to offer a number of advantages, particularly some flexibility for varying environmental conditions. Principal phases of the SO2 oxidation studies are characterized as follows. (1.) Develop equipment and techniques for the collection of representative samples of flue gas and fly ash from steam plant ducts or stacks. (2) Collect and analyze sufficient samples of flue gas and fly ash to establish the relative proportions and concentrations of SO2 and SO3, as well as pertinent physical and chemical characteristics of fly ash. (3.) Develop facilities for controlled dilution and cooling of flue gas simulating atmospheric dispersion and cooling. (4.) Develop instrumentation for evaluating changes in sulfur oxides and fly ash subjected to controlled dilution and cooling. (5.) Modify instrumentation and techniques developed in the preceding step for study of sulfur oxides and fly ash in the dispersed plume. (6.) Collect and analyze sufficient plume samples to establish the relative proportions of SO2 and SO3. (7.) Interpret and analyze data and observations. In steps 1 through 4, flue gas and fly ash samples were taken at ground level from the duct section connecting the mechanical fly ash collectors and the induced draft fan, or from the dilution chamber.##

03842

M. H. Wilkening, M. Kavano, and C. Lane

RADON-DAUGHTER IONS AND THEIR RELATION TO SOME ELECTRICAL PROPERTIES OF THE ATMOSPHERE. Tellus (Uppsala) 18, (2-3) 679-84, 1966.

The mobilities and concentrations of the short-lived decay products of radon existing as positive small ions in the lower atmosphere are measured and compared with corresponding values for ordinary small ions in the atmosphere. Seventy five percent of the radon-daughter ions with mobilities greater than 0.06 sq cm/(sec-volt) are found in the range of 0.25 to 1.50 sq cm/(sec-volt). Ion characteristic curves give no evidence for distinct mobility groups within the resolution available. Radon-daughter ions on the average are present in the ratio of three parts per 100,000 of ordinary small ions in the atmosphere. A good correlation between radon-daughter ion concentration and total small-ion content is found over a range of 100 to 1200 small ions per cc. Radon-daughter ions are found to disappear almost completely at ground level under an active thunderstorm due to upward migration of the ions under the influence of strong electric fields. The importance of radon-daughter ions in the study of the electric environment of thunderstorms is indicated. (Author summary) ##

03857

H. Israel G. W. Israel

A NEW METHOD OF CONTINUOUS MEASUREMENTS OF RADON (RN222) AND THORON (RN220) IN THE ATMOSPHERE. Tellus (Uppsala) 18, (2-3) 557-61, 1966.

The principle of measurement and its use for the determination of the radon and thoron content of the lower atmosphere is given. To achieve continuous measurements, an aspiration process was developed, permitting a direct measurement of the radon (Rn222) and thoron (Rn220) contributions to the ionization. After passing through a filter that holds back all aerosols and radon and thoron daughter ions, the air streams through an approximately 300-liter ionization chamber. The current, measured with a cibrating reed electrometer, is composed of three parts: background, radon contribution, and thoron contribution, with each component resolved by appropriate methods. The sensitivity limit amounts to some 0.8x10 to the minus 14th power c/liter for radon and 0.5x10 to the minus 14th power c/liter for thoron with a resolution time of about 220 sec. (Author summary modified) ##

03858

A. P. Altshuller, S. L. Kopczynski, W. A. Lonneman, T. L. Becker, R. Slater

CHEMICAL ASPECTS OF THE PHOTOOXIDATION OF THE PROPYLENE--NITROGEN OXIDE SYSTEM. Environ. Sci. Technol., 1(11):899-914, Nov. 1967. 29 refs.

Although it is not possible to fully represent all of the diverse effects associated with photochemical air pollution by studies of a single hydrocarbon, propylene was chosen as a representative reactive hydrocarbon. The propylene-nitrogen oxide or propylene nitrogen oxide-sulfur dioxide system when irradiated reacts readily to produce oxidant, formaldehyde, acetaldehyde, carbon monoxide, peroxyacetyl nitrate (PAN), and methyl nitrate, along with light scattering, and causes ozone and PAN-type plant damage and eye irritation. Thus, all of the major "smog" manifestations are reproducible, but not necessarily at the intensities experienced in the ambient atmosphere. The chemical and physical measurements of the photooxidation of propylene-nitrogen oxide or of propylene nitrogen oxide-sulfur dioxide over a range of reactant concentrations, at several light intensity levels, and under static or dynamic flow conditions are reported. Biological indicator measurement s will be reported in another paper. (Authors' abstract, modified)##

03953

R. D. Bojkov and A. D. Christie

VERTICAL OZONE DISTRIBUTION OVER NEW ZEALAND. J. Atmospheric Sci. 23, (6) 791-8, Nov. 1966.

Seasonal ozone profiles, representative of the autumn and winter-spring periods, are computed from 20 ascents, made using electro-chemical sensors in sondes, for Christchurch, New Zealand. The seasonal changes between the autumn and winter-spring seasons are discussed in terms of changes in successive layers at different levels of the atmosphere, and are qualitatively similar to the well authenticated changes in midlatitudes in the Northern Hemisphere. The seasonal profiles at Christchurch (43S) are compared with the corresponding vertical ozone distributions in the Northern Hemisphere, and the results interpreted as suggesting that the vertical mass exchange processes are more effective in the middle stratosphere in the Southern Hemisphere during the spring ozone build up, but the trans-tropopause exchange is greater in the Northern Hemisphere. A sequence of profiles between 14 and 23 June is used to estimate vertical velocities using an appropriate ozone continuity equation and the results compared for consistency with vertical motion inferred from the thermal profiles. (Author abstract)##

04149

L. A. Kudryavaseva

ROCKETBORNE MEASUREMENTS OF VERTICAL ATMOSPHERIC OZONE DISTRIBUTION. U.S.S.R. Literature on Air Pollution and

Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 3-8. 1961. Russ. (Tr.)
CFSTI: TT 66 62191

Recorded ozone data were secured by means of a spectrograph with a tracking system mounted on a meteorological rocket; using the method of successive approximations in processing such data the vertical atmospheric ozone distribution was determined up to an altitude of 24 km. Results pointed to a single concentration maximum from 21 to 23 km. In computing ozone concentrations by a specific equation, it was established that the factor which allowed for molecular scattering decreased rapidly with the altitude and could be disregarded above 35 km. The correction factor in the first approximation could be disregarded above 24 km; it did not exceed 2% of the ozone content at 13 km. Comparison of rocket recorded and ground made measurements indicated that ozone concentration values were of the same order for both. (Author conclusions)##

04152

T. S. Gol'm

TIME-DEPENDENT VARIATIONS IN TOTAL ATMOSPHERIC OZONE OVER DIXON IS. AND ITS CORRELATION WITH METEOROLOGICAL ELEMENTS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 28-37. 1961. Russ. (Tr.)
CFSTI: TT 66 62191

Systematic observations of total ozone in the atmosphere of Dixon Is. began with the delivery of a spectrophotometer equipped with a quartz optical system. The total ozone determinations were made using direct solar light or full moon lunar light. A brief analysis on total atmospheric ozone was done with the following results: Annual variation in total atmospheric ozone accorded generally with the mean annual variations for high latitudes. An appreciable increase in total atmospheric ozone had been observed during noon hours, although at times, total ozone variations persisted during the day. Correlation of total atmospheric ozone with tropopause height, temperature, and pressure in the upper troposphere and lower stratosphere was most distinct during summer months, and very weak during spring and fall.##

04154

G. I. Kuznetsov

OZONE AND GENERAL ATMOSPHERE CIRCULATION. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 57-72. 1961. Russ. (Tr.)
CFSTI: TT 66 62191

The following subjects are discussed in this paper: Daily ozone fluctuations; circulation index; general relationships between ozone concentration and atmospheric circulation; speculations concerning the mechanism of connection between atmospheric ozone and circulation; and southern hemisphere characteristics studies. The conclusions reached are not final, since accumulated data have not been evaluated. It is hoped that conclusions reached may suggest future investigation of relationships between atmospheric ozone and weather conditions.##

04156

R. S. Steblova

ATMOSPHERIC OZONE TEMPERATURE REGIME ACCORDING TO SPECTROSCOPIC GROUND OBSERVATIONS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 86/101. 1961. Russ. (Tr.)
CFSTI: TT 66 62191

This report discusses studies aimed at finding the correct answer to the problems related to ozone layer temperature and the connection between factors causing changes in ozonosphere properties, including temperature and vertical distribution changes in relation to lower atmospheric layers and to solar activity. The brief preliminary experimental results presented are basically intended for the description of observation methods.##

04158

G. P. Gushchin

REGULARITIES IN HORIZONTAL DISTRIBUTION OF AND SEASONAL CHANGE IN ATMOSPHERIC OZONE. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolution.) pp. 107-22. 1961. Russ. (Tr.)
CFSTI: TT 6662191

The author's purpose was to analyze the basic principles of horizontal ozone distribution and its seasonal changes from observed data and, to study basic factors and their interactions which determined the mean and instantaneous horizontal ozone distributions. The mean horizontal distribution of total atmospheric ozone can be defined by two basic factors: solar radiation and turbulent diffusion. The pattern of instantaneous horizontal atmospheric total ozone distribution was associated closely with high-altitude baric fields and, in particular, with jet streams. Naturally, principles which governed latitudinal jet stream distribution can also affect the average pattern of horizontal ozone distribution.##

04159

A. S. Britaev and A. P. Kuznetsov

CONNECTION BETWEEN ATMOSPHERIC OZONE AND METEOROLOGICAL CONDITIONS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 123-6. 1961. Russ. (Tr.)
CFSTI: TT 6662191

Atmospheric ozone and its relation to atmospheric physical processes can be used in investigating basic factors which form weather and govern the sun's effect on our planet. The relationship between ozone and horizontal air advection has been investigated. Author reviews briefly work undertaken following this subject. He concludes that vertical currents constitute a basic factor which regulates the amount of atmospheric ozone. This conclusion is compatible with data obtained by other investigators and the material presented leads to the conclusion that the relationship between ozone fluctuations and meteorological conditions can be expressed primarily in terms of horizontal and vertical atmospheric current.##

04161

A. Kh. Khrgian and G. I. Kuznetsov

DIURNAL COURSE OF ATMOSPHERIC OZONE.
Literature on Air Pollution and Related Occupational Dis-
Literature on Air Pollution and Related Occupational Diseases eases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 132-3. 1961. Russ. (Tr.)

Author tried to determine magnitudes of diurnal ozone changes from observation data of several IGY observatories. The most reliable and comprehensive data were obtained by the Vigma-di-

Valle observatory, and the less detailed, although still reliable, by the Reikjavik observatory. The frequently occurring nonperiodic diurnal ozone concentration changes should be attributed primarily to atmospheric movements, and possibly to observation errors. However, calculations of mean values (x) for individual hours during any season enable the investigator to distinguish systematic diurnal ozone content variations.##

04163

G. P. Gushchin

CAUSES OF RAPID WINTER TEMPERATURE VARIATIONS IN THE ARCTIC STRATOSPHERE. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part II - Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 143-63. 1965. Russ. (Tr.)
CFSTI: TT 66-62191

The observed zonal circulation in the stratosphere was more regular in the Southern Hemisphere than in the Northern Hemisphere. Therefore, intrusions of warm ozone-rich stratospheric air masses into the polar region were unlikely in the Southern Hemisphere during winter, indicating that the Antarctic received ozone from lower latitudes to a lesser degree than did the Arctic, thereby affecting the mean ozone distribution meridionally; less ozone was found over the South Pole than over the North Pole. It should also be noted that in the above-compiled calculations no allowance was made for cloudiness and for ice cover. Generally, the foregoing indicated that the radiative and turbulence processes and, in particular, atmospheric ozone played an important role in the complex phenomenon of stratospheric heating. However, these processes fail to explain the total complexity of the discussed phenomenon; problems of its dynamics and the possibility of solar activity effect on these processes still remain unexplained.##

04164

A. Kh. Khrgian and G. I. Kuznetsov

SOME RESULTS OF OZONE OBSERVATIONS MADE 15 FEBRUARY 1961 DURING A TOTAL SOLAR ECLIPSE. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part II - Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 164-9. 1965. Russ. (Tr.)

Ozone changes occurring during a solar eclipse throw light on the actual rate of photochemical reactions taking place in the ozone layer and on their stability. Total ozone measurements were

conducted on board a search-plane. The point was located along the path of total solar eclipse. The search plane executed 20-min forward and reverse flights along the total solar eclipse belt on a base of approximately 70 km and at a 3000 m height. Observations were made through open illuminators on the port and starboard sides of the plane. A filter-equipped universal GGO (Government Geophysical Observatory) ozonometer was used. The filter band centers were at: I--3120ra and II--3700A. The instrument was calibrated at the GGO by means of a Dobson spectrophotometer. Ozone content was determined from nomograms computed for the corresponding flight altitudes.##

04165

I. M. Dolgin and G. U. Karimova

EFFECT OF CIRCULATION CONDITIONS ON THE DISTRIBUTION OF TOTAL OZONE IN THE ARCTIC. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part II - Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 170-7. 1965. Russ. (Tr.)
CFSTI: TT 6662191

The following relationships were established by calculations of total ozone deviations from the mean of different types of synoptic processes over Dixon Is. Greatest deviations in the ozone content (+ 0.026 cm) occurred under cyclonic conditions over the Dixon Is. region, resulting from the C-type circulation. Under similar synoptic conditions, induced by W-type circulation, ozone content deviations amounted to a mere + 0.002 cm; deviation in ozone content was intermediate in the case of E-type circulation. Ozone content deviation was small for all circulation types and did not exceed -0.012 cm for the E-type circulation under anticyclonic conditions even in the Dixon Is. Region. The authors' conclusions were based on a limited volume of materials for a summer period when synoptic processes in the Arctic were less intense. The results must be considered as of preliminary nature, and incomplete for the solution of the problem. However, the observations in conjunction with similar observations by others point to the need of continued efforts in this direction.##

04166

Kh. P. Pogosyan and A. A. Pavlovskaya

CHARACTERISTICS OF WINTER AND SUMMER AIR CIRCULATION IN THE NORTHERN HEMISPHERE STRATOSPHERE. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part II - Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 177-85. 1965. Russ. (Tr.)
CFSTI: TT 6662191

The basic reasons for differences in the nature of stratospheric processes during winter and summer are: During winter, between the intermediate and high stratosphere latitude, the horizontal temperature gradient increases with height, the temperature contrast increases, winds become intensified, and in the 50-70 degree region at heights from 25 to 35 km, attain velocities of 40-50m/sec. Wind velocities above the tropopause decrease during summer becoming easterly with height; at 25 to 35 km in the region (50-70 degree), the winds normally do not exceed 10-15 7/sec. Consequently, horizontal and vertical air circulation intensity in the lower stratosphere increase with height during winter and decrease during summer. Stratospheric processes which occur during winter and summer exhibit an incomparably higher activity than those which occur during summer and fall. It also explains the frequent temperature increases in the stratosphere during winter and at the beginning of spring, which are completely unrelated to the radiative air heating.##

04167

I. K. Karol'

A COMPARATIVE ANALYSIS OF OBSERVED PLANETARY DISTRIBUTIONS OF OZONE AND CERTAIN RADIOISOTOPES IN THE ATMOSPHERE.
U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part II - Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 185-205. 1965 Russ. (Tr.)
CFSTI: TT 6662191

The relationship between observed meridional distribution of and seasonal changes in total atmospheric ozone and the world-wide distribution of radioactive fallout due to nuclear explosions was noted in 1956. Records of such observations contain no detailed analysis or comparison of existing ozone data with radioactive debris in the atmosphere. The present study represents an attempt to analyze and compare data published on meridional and vertical distributions of mean monthly ozone concentrations in relation to some radioisotopes released by giant nuclear explosions in the troposphere and lower stratosphere of the northern hemisphere. Results of the analysis should be helpful in arriving at some preliminary qualitative conclusions regarding the nature of world-wide ozone and fallout distribution in the atmosphere and on the special characteristics of universal atmospheric movements.##

04168

I. A. Govorushkin

RESULTS OF 1962 ATMOSPHERIC OZONE OBSERVATIONS IN OMSK IN JUXTAPOSITION WITH SOME METEOROLOGICAL ELEMENTS.
U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine Vol. 13. (Part II -

Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 205-12. 1965. Russ. (Tr.)
CFSTI: TT 6662191

The study of the relationship of atmospheric ozone to meteorological conditions is discussed. Total ozone is correlated with following aerological data: Temperature, pressure and tropopause height. Results are listed in a table. Coefficients between ozone, and temperature and pressure were determined for altitudes of 6, 8, 12, 14 and 16 km. Calculation results showed that close relationship existed between ozone content and meteorological elements at different altitudes; moreover, the correlation coefficient exhibited a pattern of well-defined changes during the year. The most distinct correlation between ozone and temperature and pressure was observed in the summer and autumn months. Results of calculated correlation coefficients agreed well with data obtained at other stations. The data coincidence reflects the existence of a regular relationship between ozone and meteorological elements.##

04202

Yu. A. Shafrin

STATISTICAL CHARACTERISTICS OF THE OZONE LAYER. Atmospheric and Oceanic Physics 2, (6) 390-4, June 1966.

The basic statistical characteristics of ozone distributions are calculated and the statistical stability of ozone fields and the possibilities of hydrodynamic and synoptic interpretations of ozone observations are discussed. The characteristics covered include: macroscopic autocorrelation functions of total ozone, autocorrelation and cross-correlation functions of the vertical profile of ozone concentration, and potential temperature and time spectra for total ozone. The material seems to prove the possible usefulness of statistical description of ozone fields.##

04292

W. S. Hering and T. R. Borden, Jr.

MEAN DISTRIBUTIONS OF OZONE DENSITY OVER NORTH AMERICA, 1963 - 1964. Air Force Cambridge Research Lab., Bedford, Mass., Meteorology Lab. (Rept. AFCRL-65-913.) Dec. 1965. 24 pp.
CFSTI, DDC: AD 629-989

An interim summary of the ozone climate over North America has been prepared from AFCRL ozonesonde network observations made during 1963 and 1964. Mean bimonthly distributions of ozone density computed for individual network stations depict the average ozone structure as a function of altitude and season for the first two years of network operation. Data are also presented on the standard deviation of ozone density and the mean seasonal

distributions along a meridional cross section extending from the Canal Zone to Greenland. A brief statistical analysis indicates that approximately 35 to 50 percent of the variance in the total ozone amount at middle and high latitudes is given by the fluctuations in ozone density in the 11- to 13-km or 13- to 15-km layers. (Author abstract)##

04335

L. A. Bipperton

EFFECT OF LOCAL METEOROLOGICAL AND CLIMATOLOGICAL FACTORS ON THE RESPONSE TO AIR POLLUTION. Proc. Am. Power Conf. 27, 123-5, Apr. 1965. (Presented at the 27th Annual Meeting, American Power Conference, Chicago, Ill., Apr. 27-29, 1965.)

An objection is raised against the manner by which air quality standards are derived. It is contended that meteorological and climatological factors which influence the action of airborne chemicals must be considered. The effects of temperature, wind, humidity, pressure and sunlight are discussed. It is concluded that these local factors, in addition to the effect of mixtures of pollutants, will have to be taken into account if fair judgments are to be made on air quality standards.##

04355

J. B. Harrington, Jr.

ATMOSPHERIC POLLUTION BY AEROLLERGENS: METEOROLOGICAL PHASE. (FINAL REPORT) VOL. II. ATMOSPHERIC DIFFUSION OF RAGWEED POLLEN IN URBAN AREAS: TEXT. VOL. III. TABLES. Thesis (Ph.D.) Michigan Univ., Ann Arbor, Dept. of Meteorology and Oceanography ORA Proj. 06342, Nov. 1965. 629p.

The poisoning of the atmosphere by biological materials constitutes a serious health hazard. It is estimated that 18 to 27 million Americans suffer from asthma and hayfever caused by ragweed pollen alone. Computation of the concentration of ragweed pollen over an urban area requires a satisfactory mathematical model, a knowledge of the appropriate parameter values and boundary conditions and a method of solution which does not require overly restrictive assumptions. A technique for predicting the concentration of ragweed pollen within an urban area and the comparatively relative contributions to that concentration form internal and external sources is developed in this study.##

04461

D. Golcmb, N. W. Rosenberg, C. Aharonian, J. A. F. Hill, and H. L. Alden

OXYGEN ATOM DETERMINATION IN THE UPPER ATMOSPHERE BY CHEMILUMINESCENCE OF NITRIC OXIDE. J. Geophys. Res. 70, (5) 1155-73, Mar. 1, 1965.

Atomic oxygen density profiles in the 90-140 km altitude region have been obtained by analyzing the radiation intensity of chemiluminous nitric oxide trails deposited by rockets into the upper atmosphere. The trails consist of a very bright headglow and a dimmer afterglow. The headglow is believed to originate in the mixing zone around the NO jet expanding into the atmosphere. A gasdynamic model is given defining the reaction volume and time for the NO-O reaction in the headglow. Oxygen atom densities are evaluated by applying the gasdynamic model to the radiation intensity of the headglow. The resulting altitude profiles indicate maximum oxygen atom densities in the 103-107 km region.##

04527

T. M. Donahue

IONOSPHERIC REACTION RATES IN THE LIGHT OF RECENT MEASUREMENTS IN THE IONOSPHERE AND THE LABORATORY. Planetary Space Sci. 14, 33-48, 1966.

An attempt is made to obtain a set of ion-molecule reaction rates and recombination coefficients consistent with recent mass spectrometric data obtained between 120 and 220 km. It is found that the daytime ionospheric data at 130 km are explicable in terms of the processes all in good agreement with the most recent laboratory data. To account for the ion densities at higher altitudes it is known that many rates must have strong temperature dependences. In particular the O (plus) removal rates cannot increase with temperature and the N2(plus), O ion-atom interchange rate must decrease with increasing temperature. The recombination coefficient for NO (plus) decreases with electron temperature, while that for O2 (plus) decreases more slowly, and that for N2 (plus) probably decreases very slowly with temperature. To account for the nighttime ionosphere with the reaction rates implied by the daytime data there must be weak sources of ionization above 180 km and below 140 km with rates of the order of 5-10 ion pairs/cc. The data also indicate that O2 (plus) NO charge exchange must be very rapid with a rate of the order of 5x10 to the -10th power cc/sec. (Author abstract modified)##

04548

D. B. Turner

RELATIONSHIPS BETWEEN 24-HOUR MEAN AIR QUALITY MEASUREMENTS AND METEOROLOGICAL FACTORS IN NASHVILLE, TENNESSEE. J. Air Pollution Control Assoc. 11, (10) 483-9, Oct. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

This study was undertaken to determine how well daily city-wide air quality measurements can be related to some easily obtained meteorological parameters affecting source strength, dilution, and dispersion of pollutants. As part of the Community Air Pollution Study in Nashville, Tennessee, 24-hour air quality measurements of sulfur dioxide and soiling index were made at 32 locations in the urban area. It may be concluded that the meteorological variables of temperature, wind speed, and stability are well related to the sulfur dioxide concentrations and soiling indices. A system for classifying stability on an hourly basis for research in air pollution is provided in an appendix.##

04677

G. M. Hidy J. R. Brock

PHOTOPHORESIS AND THE DESCENT OF PARTICLES INTO THE LOWER STRATOSPHERE. J. Geophys. Res. 72, (2) 455-60, Jan. 15, 1967.

Calculations are presented for the photophoretic force acting on an opaque spherical particle moving in the free molecule regime. The theoretical results are used to estimate the time of descent of small particles from high levels of an idealized stagnant atmosphere to the lower stratosphere. The theory indicates that a difference in settling timesshould exist between nonmetallic particles of low thermal conductivity and metal particles of higher conductivity. Despite such differences, the estimated descent times, for example, of 0.1-micron radius particles ranging from conductivities of 0.0008 to 0.08 cal/(sec cm deg K), traveling from 100 to 20 km altitude, remains approximately the same, the order of 1000 days. The photophoretic effect on particles of low conductivity can become appreciably below 30 km altitude. Nevertheless, this force does not appear to contribute significantly to decreasing the total time required for material to settle from very high altitude to the lower stratosphere. (Author abstract)##

04866L

Arthur, W. and A. Beiser

METHODS OF PROMOTING THE REMOVAL OF FREE ELECTRONS FROM AN IONIZED AND DISSOCIATED ATMOSPHERE. Nuclear Research Associates, Long Island City, N. Y. (Nra Rept. 113-400-4.) (Rept. AFCRL-63-380 and DASA MIPB 554-61.) June 1963. 25 pp.

This is the final report of a study of methods of promoting the removal of free electrons from an ionized and dissociated atmosphere. It included an analysis of the atomic and ionic processes relevant to the above and a quantitative assessment of the various possible means for removal of free electrons from such an atmosphere, including estimates of time scales, efficiencies, and power requirements.##

04977

H. Neuberger M. Gutnick

EXPERIMENTAL STUDY OF THE EFFECT OF AIR POLLUTION ON THE PERSISTENCE OF FOG. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949. pp. 90-6.

Fog characteristics were determined by the measurement of transmitted light through artificial fog. Considering the time necessary for various fogs to dissipate completely, a continuous increase in fog duration was found with increasing air pollution. The concentration of condensation nuclei was considered a criterion of the degree of air pollution. The effects of electric charge on nuclei were studied. Although fog density was only slightly influenced by the quality of combustion, the fog duration was greatly increased by poorer combustion. Also studied were the relationships between nuclei concentration, decay time, percent light transmission, and the size and number of droplets in fog.##

04987

M. D. Thomas

THE PRESENT STATUS OF THE DEVELOPMENT OF INSTRUMENTATION FOR THE STUDY OF AIR POLLUTION. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 16-23.

Numerous instruments are discussed for the study of sulfur dioxide, hydrogen sulfide, mercaptans, other sulfur-containing gases, hydrogen fluoride, smog gases, particulate matter, wind, and other meteorological parameters.##

04988

R. D. Cadle H. S. Johnston

CHEMICAL REACTIONS IN LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 28-34.

Chemical reactions in smog are either reactions between two or more man-introduced contaminants or between an impurity and the natural components of the atmosphere. This paper discusses (1) certain well-known reactions which must certainly occur, (2) experiments to determine the nature of other reactions expected to occur under conditions which exist in the Los Angeles atmosphere, and (3) speculations about some reactions which may occur. Several investigators have discussed certain types of reactions which possibly occur in smog. Haagen-Smit has suggested that reaction products of olefins with ozone and oxides of nitrogen in the presence of sunlight are responsible for some of the unpleasant properties of smog.

Johnstone has discussed the oxidation of sulfur dioxide to sulfur trioxide in the atmosphere, which would result in the formation of a mist of sulfuric acid. Blacet has proposed several photochemical reactions which could contribute to the ozone content of smog; in particular, he considered photoactivation and photolysis of nitrogen dioxide, sulfur dioxide, and aldehydes.##

C4991

P. E. Church

SOME NEW DEVELOPMENTS IN MICROMETEOROLOGICAL STUDIES OF THE ATMOSPHERE. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 47-53.

The following studies are considered incoming radiation at Seattle; concentration of pollution from filters; temperature distribution in turbid air; nightime cold layer; small-scale air motions; frequency and magnitude of lapse rates; and dew-point gradients.##

05034

A. V. Borisov

THE SIBERIAN SMOKE HAZE OF 1959. Priroda (5) 65-56, May 1961. Russ. (Tr.) (Translated as JPRS 14250)

The extensive reduction in visibility in mid-July 1959 is revieved. The source of the reduction in direct solar radiation and the increase in the percentage of scattered radiation was smoke from a forest fire.##

05055L

G. B. Spindler

RESULTS OF THE NITRIC OXIDE SEEDING PROGRAM. Canadian Armament Research and Development Establishment, Valcartier, Canada. Sept. 1965. 84 pp. (CARDE Technical Rept. No. 538/65.)

Observations on a series of nitric oxide releases in the E-Region are described. As a result of these observations, changes are suggested in the current kinetic theory of the NO - O reaction and a new reaction model is presented. It is proposed that the NO - O reaction, at least at E-Region pressures, is bimolecular and, in line with the findings of other experimenters, that the effective rate constant there may be faster than the value obtained for this reaction in the laboratory. Atomic oxygen profiles for two different latitudes are presented as well as

evidence for a latitude effect on the profiles. The altitude at which atmospheric flow changes from turbulent to laminar is also different at these two latitudes. It is probable that atomic oxygen concentration drops sharply below 80 km, but above the peak of the profile, concentration falls with a first decadic scale height of 14 km, in agreement with photochemical theory. Observations on the wind-distorted luminous trail show a strong wind shear present in each case near 100 km. (Author abstract)##

05085

G. F. Schilling

COMMENTS ON "THE SECULAR INCREASE OF THE WORLD-WIDE FINE PARTICLE POLLUTION". Rand Corp., Santa Monica, Calif. (1964) 7 pp.

Shipboard measurements of atmospheric conductivity away from land should be a valid indication of the magnitude of an persistent degree of radio-active contamination of the air itself. It can be reliably inferred from Gunn's (1964) results that any radioactive contamination of the free air had indeed by May 1962 returned to such small values that it was not detectable as a secular increase in the electrical conductivity. This should have been the case again, following the last series of nuclear explosions in the atmosphere in 1962.##

05087

W. S. Spicer, Jr.

AIR POLLUTION AND METEOROLOGIC FACTORS (EFFECTS ON NORMAL SUBJECTS AND PATIENTS WITH RESPIRATORY DISEASE). Arch. Environ. Health 14, (1) 185-8, Jan. 1967 (Presented at the Eighth Annual American Medical Association Air Pollution Medical Research Conference, Los Angeles, Mar. 2-4, 1966.)

Small groups of normal subjects and diseased individuals were monitored physiologically with the expectation that patterns of respiratory functional variations, which are common to groups of subjects, may become apparent; that the nature of these patterns may give an indication as to the identity, intensity, and duration of the stimuli and physiologic responses; and that this may lead to the physiologic grouping of certain individuals which may allow the detection of a segment of the population which is particularly susceptible to acquiring chronic obstructive respiratory disease. Subjects were studied predominantly with the whole body pressure plethysmograph and spirometer. In a group of young adults, respiratory function varied between October and May; this variation resembled a single cycle with poorest function occurring in February to March; the vast majority of these subjects underwent parallel changes in function, maintaining the same physiologic position one to another from study to study; and, after correction of intergroup differences,

these respiratory functional changes correlated significantly, and best, with temperature so that airway resistance increased as temperature decreased.##

05205

M. Nicolet

IONOSPHERIC PROCESSES AND NITRIC OXIDE. Pennsylvania State Univ., University Park, Dept. of Electrical Engineering (Scientific Rept. No. 228.) (Rept. No. AFCRL-64-948.) Dec. 20, 1964. 29 pp.

Analysis of ionic processes in the ionosphere leads to the conclusion that nitric oxide and its ion are produced by a reaction between nitrogen molecules and molecular oxygen ions. Such a process implies a substantial increase of NO in the E layer to a value greater than the photochemical concentration. In the lower D region, N plus 2 and O plus 2 ions produced by cosmic rays are transformed into NO plus ions. A quantitative estimate shows that these conclusions are consistent with observational data in the chemosphere and ionosphere and also suggests the explanation of the night airglow continuum. (Author abstract)##

05228

J. J. Fuquay

NATURAL REMOVAL PROCESSES IN THE ATMOSPHERE. Hanford Labs., Richland, Wash. 1963. 16 pp. (Rept. No. HW-SA-3144.) (Presented at the U.S. Public Health Service Training Course on Meteorological Aspects of Air Pollution, Berkeley, Calif., Aug. 12-16, 1963.)

The removal of material from the atmosphere may occur in a number of different ways. Particles large enough and heavy enough will settle to the ground due to the action of gravity. Some gaseous material may be removed by absorption upon particulate matter in the atmosphere or by chemical reactions changing the material into a new compound. Adsorption may also take place at the ground by the earth's surface or by vegetation. Impaction of particles onto buildings and vegetation and turbulent impaction upon the earth's surface are very significant removal processes. Precipitation also removes material from the atmosphere by interception of particulates by falling raindrops (washout) or by raindrop formation within clouds and subsequent falling as precipitation (rainout). All of the foregoing removal mechanisms are discussed and analyzed mathematically. In addition, the physics of fogs are studied including the topics of heat, smoke, water, and sulfur balance.

05405

R. Gunn

PRECIPITATION POTENTIALS IN A HOMOGENEOUS AEROSOL. J. Colloid Sci. 23, (1) 52-61, 1967.

Aerosol particles immersed in an ionized environment, accumulate through ionic diffusion free electrical charges that control a number of fundamental aerosol characteristics. The distribution of free charges among the aerosol particles has been worked out. It is assumed that ion production is just balanced by the consumption due to recombination between the ions plus ion diffusion onto the aerosol particles. This permits a calculation of the positive and negative light ion conductivity ratio in the environmental air. This ratio, in turn, determines the magnitude of the particle free charge averaged with respect to sign. The analysis leads to useful expressions for the electrical conductivity within the aerosol space. The foregoing estimates permit a determination of the free electrical charges per unit time and per unit area transferred toward the earth by gravity. This charge transfer by precipitation establishes an electric field that builds up to an equilibrium which produces, in turn, a reversed ionic current. The intensity of the generated electric field is determined from aerosol constants and the derived basic relationships. The potentials established by the charge transfer process are calculated by integrating the electric field between limits set by the applicable geometry. The potential differences in a stable nonprecipitating cloud may be thousands of volts. Numerical values for five different typical aerosol clouds are tabulated to illustrate the principal properties of such clouds and the scope of this investigation. (Author's abstract)##

05282

R. A. McCormick

ATMOSPHERIC TURBIDITY. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-32.)

The optical effects of air pollutants which determine atmospheric turbidity are reviewed and methods currently utilized for turbidity measurements are outlined. The utility of such data for characterizing the aerosol loadings of urban pollution envelopes is discussed. Implications are drawn with respect to the significance of a suspected secular trend in atmospheric turbidity as it may affect the heat balance of the earth-atmosphere system. (Author abstract)##

05451

K. Kato

IONS IN AIR. IONS AND METEOROLOGY. (LECTURE 2). Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo) 1(1) 49-56, 1964. Jap.

Ions are produced when a metal surface is irradiated with light of a certain wavelength, when ultraviolet rays pass through gas, when water drops break up in a gas according to the Lenard effect, or when radiation passes through air. Cosmic rays also ionize air. One of the characteristics of the ions is their mobility, expressed as K = U/E, where U = average velocity of the ion and E = electric field strength. K was measured using a concentric cylinder. The mathematiclal derivation of K using this cylinder is given. Both automatic and non-automatic ion counters are described and schematic diagrams given. Since ions affect health, the daily change in the quantity of ions formed is given with data gathered at Iida-Shi, Nagano-Ken, and Tanashi-Cho, Tokyo. The relationship between ion concentration and temperature is explained. The number of ions produced depends a great deal on weather. The size and kinds of rain drops influence the number of both positive and negative ions. When visibility is reduced, the concentration of small ions is also usually reduced. A higher concentration of small ions is generally found on a clear day.##

05459

Shafrin, Yu. A.

FUNDAMENTALS OF THE STATISTICAL METHOD OF SOLVING THE INVERSE PROBLEM OF OZONE MEASUREMENT. Atmospheric Oceanic Phys. (English Translation), 2(11):710-5, 1966. Russ. (Tr.)

A mathematical validation of the statistical method of computing the thermal, conservative, and dynamic characteristics of the atmosphere from data based on the ozone concentrations from 10 North American ground stations is presented. The basic difficulty in interpreting ozonometric data is overcome if the nonperiodic and short periodic disturbances from unknown causes and discharges are eliminated. Satellite ozonometry has the advantage of giving within a few hours a simultaneous indication of the global ozone field. Interpretation of the ozonometric data could provide an aid in the synoptic short-term and mathematical long-term weather forcasting.

05474

A. A. Townsend

WIND AND THE FORMATION OF INVERSION. Atmos. Environ. 1, (2) 173-5, Mar. 1967.

The author presents his views on the formation of nocturnal inversions to provide a theory for discussion since there is no general agreement regarding the conditions that permit their growth and persistence. These layers of stably-stratified air near the ground have considerable influence on the diffusion and transport of pollution. While it is obvious that the surface wind is light or negligible, it is not necessary during an inversion that the wind over the top of the inversion

be unusually small. The wind over a nocturnal inversion is comparable with the maximum surface wind of the preceding day, and values up to 15 meters/second are likely. The suppression of turbulence is based on the removal of solar heating and a cooling of the ground which reverses the convective flux of sensible heat within a layer whose depth increases with time at a rate comparable with friction velocity. For an inversion layer to last over several days, no considerable quantity of solar radiation may reach the surface and in consequence, the radiative cooling of the ground is prevented. Without a downward heat-flux into the ground, the mechanism for suppressing outbreaks of wind will not operate, and over level terrain, the surface wind will be near the gradient wind. In valleys the acceleration may be prevented by tilting of isothermal surfaces.##

05482

A. F. Hidalgo C. Orr, Jr.

HYSTERESIS IN SMOG AND FOG DISAPPEARANCE (FINAL REPT. JUNE 1, 1964-SEPT. 31, 1966). Georgia Inst. of Tech., Atlanta, Engineering Experiment Station. (Sept. 31, 1966.) 224 pp.

The behavior of an artificial fog produced by the adsorption of water vapor upon NaCl nuclei in the Aitken range, i.e., from 0.01 to 0.1 micron in diameter was studied. The object was to obtain information on the size of particulates as a function of relative humidity following a given time lapse after equilibrium humidity was achieved. Special emphasis was given to a determination of the relative humidity at which supersaturated solution droplets nucleate and crystallize as a function of the time delay. An ion counter affords a satisfactory technique for studying the homogeneous nucleation of solutions. Hysteresis as encountered in the disappearance of an aerosol of NaCl solution droplets is a function clearly dependent on the residence time of the aerosol after achieving equilibrium relative humidity conditions. The interfacial tension between a NaCl nucleus of crystallization and the mother liquid phase is estimated to be 12.9 ergs per cm2 at a solution concentration 9.0 molal. Estimations of the embryo critical size range from 31 A at a solution concentration 6.5 molal to 5 A at 8.5 molal. These sizes appear to be low, although the values are of the correct order of magnitude. Droplets of a given size and concentration undergo nucleation in accordance with a log-normal function of time. Results obtained suppor t the position that hysteresis in the disappearance of natural fogs, especially in the absence of organic atmospheric contamination, is controlled by homogeneous nucleation. Estimations of the properties of supersaturated solution s of potassium chloride by means of a guided extrapolation of experimental osmotic coefficients give results that agree very well with the available fragmentary vapor pressure data.##

05533

Altshuller, A. P., S. L. Kopczynski, W. Lonneman, and D. Wilson

PHOTOCHEMICAL REACTIVITIES OF EXHAUSTS FROM 1966 MODEL AUTOMOBILES EQUIPPED TO REDUCE HYDROCARBON EMISSIONS. J. Air Pollution Control Assoc., 17(11):734-737, Nov. 1967. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-6.)

In the summer of 1966, some automobiles from the Cincinnati phase of the GSA study were used in an irradiation chamber study to evaluate the photochemical air pollution potential of representative models of equipped and unequipped automobiles. Only one set of automobiles, the unequipped Chevelles, produced exhaust capable under irradiation of forming significant levels of oxidant and PAN. Neither the equipped Chevelles nor any of the Fords or Plymouths, whether equipped or unequipped, produced exhaust having the characteristics necessary to form oxidant or PAN upon irradiation. The eye irradiation level reported by the panel upon irradiation of exhaust from unequipped Chevelles was much higher than that produced by the irradiated exhausts from any of the other types of automobiles. Overall, there does appear to be some small improvement with respect to eye irritation in comparing equipped automobiles with unequipped automobiles. To a large extent, the improvement in the air pollution potential of exhausts from equipped Chevelles compared to the unequipped Chevelles can be attributed to the reduction in the hydrocarbon to nitrogen oxide ratio. The irradiated exhaust from equipped Chevelles, except for aldehyde levels, is about the same in photochemical air pollution potential as are the exhausts from unequipped Fords and Plymouths. Such irradiation chamber measurements are related to exhaust reactivities. Hydrocarbon reactivities can be obtained by direct measurement of reactive and nonreactive hydrocarbons in the automotive emissions.**

05575

G. P. Larson, J. R. Taylor, and W. J. Hamming

STUDIES OF POLLUTION LEVELS IN RELATION TO AIR MOVEMENT IN THE LOS ANGELES ATMOSPHERE. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955. pp. 33-42.

Samples were collected in dustfall jars from a large number of stations in the Los Angeles Basin. The results are plotted in tons per square mile for SO2, salt, total dustfall, and water insoluble solids. The results of a nitrogen dioxide survey are also plotted showing surface trajectories for air, cross sections, and area distribution. Subsequent to these studies, 50 wind stations were established throughout the basin making it possible to demonstrate the effects of two separate source areas on adjoining areas. To determine the variations that could occur

during smoggy periods when one source area might influence the other, the variations in air flow trajectory were studied. CO, nitrogen oxides, and hydrocarbons were measured hourly at several locations in both areas. The oxidation of hydrocarbons to produce eye irritation was also studied. These investigations illustrated the importance of relating the air movement to the sources of pollution, in order to anticipate influences that may be effected in the surrounding areas.##

05576

R. Stair

THE SPECTRAL RADIANT ENERGY FROM THE SUN THROUGH VARYING DEGREES OF SMOG AT LOS ANGELES. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., pp. 48-55 (1955)

Studies have indicated that ozone and/or combinations of the oxides of nitrogen as well as a number of other compounds are present in deleterious amounts in the Los Angeles smog. The present research was set up to examine the possibility of determining the amount of these or other pollutants present, in terms of their ultraviolet, visible or near infrared absorption spectra. In connection with the evaluation of the spectral distribution of the radiant energy from the sun, a spectro-radiometer had been set up. Data on the spectral radiant energy from the sun were available for two stations having clear atmospheres free from smog. Similar measurements within the Los Angeles area were compared with these previous data to display selective spectral absorption characteristics of some of the pollutants present in significant amount in the smog.##

05683

Dmitriev, M. T.

SOME PHYSICAL AND CHEMICAL PROCESSES IN AIR CAUSED BY IONIZING RADIATION. Atmospheric and Oceanic Physics (English Transl.) 1 (3), 179-84 (Mar. 1965). Russ. (Tr.)

A study was made of the physical and chemical processes which are of geophysical interest. In order to simplify the presentation, only the data which bear on the components of air are given. Some physical and chemical process in air such as ionization, molecule dissociation, production of ozone, nitric oxides and carbon dioxide caused by ionizing radiation and in particular by nuclear processes, are analyzed. The data obtained can be used to evaluate the effeciency of different ionizing radiations in the atmosphere.

05711

F. Hesstvedt

ON THE SPATIAL DISTRIBUTION OF SOME HYDROGEN COMPONENTS IN THE MESOSPHERE AND LOWER THERMOSPHERE. Tellus (Uppsala) 17 (3) 341-9 (Aug. 1965).

On the basis of a photochemical oxygen-hydrogen atmosphere model, the concentrations of OH, HO2, H2O and H were computed as a function of height, latitude and season. The computations were made for two values of the hydrogen-air mixing ratio, differing by a factor of about 100. Atomic hydrogen was found to be the major hydrogen constituent above about 85 km, while water vapor takes up almost all hydrogen at levels below about 85 km. In the shallow layer between these two regimes molecular hydrogen enters as the major hydrogen component. The seasonal and latitudinal variation was found to be relatively small. The effect of the air motion is discussed. An ascent of 1 cm/s near the high latitude summer mesopause seems to be necessary to keep the moisture content high enough for ice clouds to form. (Author abstract) ##

05801

Chambers, L. A. and Mader, P. P.

SOME PROPERTIES AND RELATIONSHIPS OF ETHER SOLUBLE ORGANIC PARTICULATES IN THE LOS ANGELES ATMOSPHERE. Proc. Air Pollution Control Assoc., Semi-Ann. Tech. Conf., San Francisco, Calif., 1957. pp. 273-81.

Attention has been drawn to the possible relationship between the organic aerosols observable in Los Angeles atmosphere and the eye irritants and reduced visibility characteristic of the local air pollution problem. While no intensive study of the nature of the aerosols, or of the conditions of their formation, or their exact relationship to other smog circumstances was maintained, members of a research staff have made sporadic studies of the amounts, and superficial chemical properties, of the organic particulates and have speculated on their possible role in smog and its more obvious effects. A more systematic analysis of the temporal variation in organic aerosols has resulted in sufficient accumulation of data to permit statistical correlation with eye irritation, atmospheric transparency, and other factors related to air pollution. While the facts available, as discussed in this document, are insufficient to establish many firm conclusions, they are provocative enough to justify the present summarization, and should stimulate much more extensive and detailed consideration of the properties of organic aerosols as related to smog.

05810

M. J. Pilat and R. J. Charlson

THEORETICAL AND OPTICAL STUDIES OF HUMIDITY EFFECTS ON THE SIZE DISTRIBUTION OF A HYGROSCOPIC AEROSOL. ((J. Rech. Atmospheriques (France) 2, 165-70 (1966).

The effect of humidity upon the light scattering coefficient and correspondingly the size, of a NaCl aerosol was calculated and observed. The aerosol radius was calculated as a function of relative humidity using a physical adsorption equation for the solid NaCl particles and a combination of Raoult's law and the Kelvin equation for the liquid solution droplets. The Rayleigh equation was used to calculate the ratio of the scattering coefficient at some humidity to the scattering coefficient at zero humidity. The predicted increase in the ratio of scattering coefficients is between one and two orders of magnitude for the phase transition of a solid salt particle to a saturated solution droplet, which agrees favorably with the ratio optically measured with an integrating nephelometer. (Authors' abstract)##

05817

E. R. Stephens

THE REACTIONS OF AUTO EXHAUST IN SUNLIGHT. Preprint. (Presented at a Session of the Conf. Air Pollution Research on "Atmospheric Reactions of Constituents of Motor Vehicle Exhaust," Los Angeles, Calif., Dec. 5, 1961.)

When auto exhaust is diluted with air and exposed to sunlight chemical changes take place which lead to a variety of noxious products. Among these are eye irritants, plant toxicants, and aerosols. These effects can also be observed when dilute mistures of hydrocarbons, nitrogen oxides, and sulfur dioxide with air are irradiated. A number of the noxious products have been identified. Ozone and a new series of compounds called the peroxyacyl nitrates (PAN) are the principal plant toxicants formed by this reaction. The various members of the PAN family are powerful eye irritants as are the formaldehyde and acrolein produced in this oxidation reaction. The formation of products such as PAN and alkyl nitrate indicates the presence of organic free radicals since these compounds most probably arise through the reactions of the appropriate radicals with nitrogen dioxide. The corresponding reactions with nitric oxide probably lead to its oxidation to nitrogen dioxide, a phenomena which is observed and which is required to account for the formation of ozone. (Author abstract)##

05818

E. R. Stephens, W. E. Scott, P. L. Hanst, and R. C. Doerr

RECENT DEVELOPMENTS IN THE STUDY OF THE ORGANIC CHEMISTRY OF THE ATMOSPHERE. Preprint. (Presented at a Session on Smoke and Fumes, 21st Midyear Meeting, ((American Petroleum Inst., Division of Refining, Montreal, Canada)), May 16, 1956.)

A long-path IR cell, with which it is possible to detect many

compounds in the air at concentrations in the parts-per million range, is being used to study reactions of air pollutants. Field studies of the Los Angeles smog by other investigators have shown that photochemical reactions caused by sunlight play an important role in its development. In the laboratory it has been demonstrated that O3 is formed when mixtures of NO2 and an organic compound in air are irradiated with artificial sunlight. This paper presents the results of further studies on this and other reactions of air-pollution chemistry. IR analysis of the products of the photochemical reaction between NO2 and an organic compound frequently reveals, in addition to bands of known compounds, several unidentified absorption bands which apparently belong to a single compound produced in significant quantity. Although this compound is unstable, moderately pure samples of it can be condensed if the reaction products are drawn through a cold trap. Physical and chemical properties of this condensate, referred to as compound X, are consistent with the belief that it is an acyl-nitrogen compound, but its structure is not unequivocally determined. The importance of compound X in an explanation of the chemistry of the atmosphere is stressed. O3 is formed when compound X is irradiated, with or without added gasoline. O3 formation is slower with added gasoline, perhaps because the olefins present in the gasoline react with some of the O3. O3 is also formed when nbutyl nitrite is photolyzed in O2. The rate of formation of O3 was only slightly changed when SO2 was present in an irradiated mixture of olefin and NO2. Since the SO2 disappeared very slowly, it was concluded that neither the O3, the free radicals, nor any peroxides which are formed will oxidize SO2 to SO3 at a significant rate. (Author abstract modified)##

05821

Subbaratnam, N. R. and J. G. Calvert

THE PHOTOOXIDATION OF AZOMETHANE AT 25 DEGREES C. Preprint. (1961).

Recently Kutschke and co-workers have reported the identification of methyl hydroperoxide (through mass spectrometry) in the products of azomethane photooxidation. The work reported here was initiated to test he observation of the Kutscheke group. Azomethane photolysis was the source of methyl radicals in this work. Measured pressures of azomethane in the introduction system were expanded into the evacuated glass tank which effected a calculable dilution; the desired atmosphere of oxygen, or acetaldehyde and oxygen, was added, and a period of 15 min. was allowed to ensure homogeneity of the mixture. In the usual experiments a continuous irradiation of the selected mixture was made; the IR spectrum of the desired region was scanned at measurable intervals. A continuous recording of the "oxidant" concentration was made with the ozone recording equipment. Results established that the formation of methyl hydroperoxide in the methyl radical-oxygen system in oxygen-rich media at 25 deg C is probably formed either in a reaction involving nonthermally equilibrated methyl peroxyl radicals and some source of abstractable H-atoms or in a reaction of disproportionation between two radicals. Methyl hydroperoxide is a relatively minor primary product of the reaction between

methyl radicals and oxygen in oxygen-rich media at 25 deg. C. The major products, methanol and formaldehyde, reported previously for these systems, are confirmed. Some evidence for the formation of an unknown oxidant other than CH3O2H was observed in experiments at very low azomethane concentrations and in runs with added acetaldehyde.

05920

A. V. Havens

MICROCLIMATOLOGY. In: Seminar on Human Biometeorology. ((Rutgers - The State Univ., New Brunswick, N.J., Dept. of Meteorology.)) (PHS Publ. No. 999-AP-25.) (Presented at the Seminar on Human Biometeorology, Cincinnati, Ohio, Jan. 14-17, 1964.) 1967. pp. 61-72.

This discussion of microclimatology is concerned with the boundary layer of air where the earth's surface energy exchange is effective. In this area, which may vary in height from a few hundred feet to several thousand feet, the relationships of pressure gradient, coriolis effect of the earth's rotation, and wind speed and direction as expressed in classical principles do not apply. The microclimate is modified by various activities of man (e.g., crop-protection techniques of heating and windbreaks, construction of structures, and the build-up of urban areas) and by topography, including all variations in altitude and slope, however slight. Figures are given that illustrate the inversion temperature phenomenon, important in any study of air pollution. (Author summary)##

06043

M. Neiburger

METEOROLOGICAL ASPECTS OF OXIDATION TYPE AIR POLLUTION. (In: The Rossby Memorial Volume.) California Univ., Los Angeles, Dept. of Meteorology. 1959. pp. 158-69.

The replacement of coal by petroleum products as an energy source, instead of eliminating air pollution, has led to a new type of air pollution characterized by the presence of oxidizing substances, chiefly ozone, and the occurrence of eye irritation, damage to vegetation, and reduction to visibility. It has been shown that photochemical reactions involving hydrocarbons and nitrogen dioxide in concentrations of a few parts per million can produce all these manifestations. The photochemical reactions require the combination of (1) sources of reagents, (2) conditions which prevent their dispersal, and (3) adequate solar radiation. The tremendous concentrations of automobile traffic, the exhaust from which is estimated to contain 7 percent of the hydrocarbons put into the fuel tank, in all metropolitan centers in the U.S. constitute sources which are at least as large as industrial sources (refineries). However, only on the subtropical west coasts of continents do the metecrological conditions for

accumulation of pollutants, namely persistent light winds and temperature inversions, occur consistently together with adequate solar radiation. The outstanding example of this combination is Los Angeles, California. Studies of the relationship of air trajectories to the smog manifestations in Los Angeles are presented. These studies demonstrate the contribution of automobile exhaust as a principal source. (Author's abstract)##

06047

J. V. Dave and P. M. Furukawa

THE EFFECTS OF SCATTERING AND GROUND REFLECTION ON THE SOLAR ENERGY ABSORBED BY OZONE IN A RAYLEIGH ATMOSPHERE. J. Atmospheric Sci. 24(2):175-181, March 1967.

The effects of Rayleigh scattering and Lambert ground reflection on the solar energy absorbed by ozone in the earth's molecular atmosphere are evaluated on the basis of a complete solution of the transfer equation. The results show that these processes increase the following over that for a purely-absorbing atmosphere: (1) the total solar energy absorbed by ozone in a unit atmospheric column, (2) the energy absorbed per unit mass of air at all levels (except below 100 mb at low sun), and (3) the heating rates due to the absorption of solar energy by ozone. In each case, the magnitude of the increase can vary considerably depending on the solar zenith angle and the reflectivity of the underlying surface. (Authors' abstract)##

06069

G. Pfefferkorn

(PHOTOCHEMICAL FORMATION OF DROPLETS WITH LOW EVAPORATION RATE FROM ORGANIC VAPOR IN THE AIR.) Photochemische Bildung schwerfluchtiger Tropfchen aus organischen Dampfen in Luft. STAUB (Duesseldorf) 27(3):138-140 (March 1967). Ger.

When solid surfaces in air containing organic vapours are irradiated with soft X-rays or ultraviolet rays, liquid phases are formed which appear in the form of droplets. They have such a low vapour pressure that they remain stable in the high vacuum of an electron microscope. The formation of droplets depends on the steam content of air and on gas traces. Further, the surface condition also plays an important role. This formation of droplets is similar to smog formation by photooxidation. (Author's summary)##

06080

F. P. Terraglio R. M. Manganelli

THE ABSORPTION OF ATMOSPHERIC SULFUR DIOXIDE BY WATER SOLUTIONS. J. Air Pollution Control Assoc. 17 (6), 403-6 (June 1967).

Results of a laboratory study indicate that the rate of solution of atmospheric SO2 in distilled water, over the range of atmospheric concentrations of 0.81-8.73 mg SO2/cu m, is a function of the concentration of SO2 in the atmosphere, with saturation being reached more rapidly at the higher concentrations. This would indicate that rain water, with constantly renewed surfaces, can be very effective in the removal of atmospheric SO2. The pH of the exposed water samples reached values of 4.0 or less, comparable to values observed in fog and cloud near large industrial areas. Overall solubility of SO2 in distilled water did not follow the law of partial pressure. At the atmospheric concentrations used it was found that over 98.5% of the sulfite in solution was in the form of the HSO3 ion with the remainder present as unionized H2SO3 acid. Computations using the concentration of unionized H2SO3 acid in the solution showed that the solubility of this portion of dissolved sulfite did follow the law of partial pressure.##

06235

Goetz, A. Stoeber, W. and T. Kallai

SYNERGISTIC PROPERTIES OF AEROSOLS (FINAL PROGRESS REPT. JAN. 20, 1961-Nov. 15, 1961) California Inst. of Tech., Pasadena, 49 pp. Nov. 15, 1961.

The general subject of this Report is the interaction of air-borne particulates with gaseous trace components of the atmosphere which leads to their accumulation upon these nuclei and causes what is commonly called "aerosol formation". An understanding of these processes is important because this accumulation of irritating substances may produce their synergistic intensivation, and the growth of these particulates increases their capacity for diffuse light scattering and causes the well-known visibility restriction by smog-like aerosols. The studies reported center on the physical aspects of aerosol formation, particularly on those resulting from photochemical reactions between NO2 and olefinic hydrocarbons. Instrumentation and methods, especially developed for the synthetic production of such aerocolloid systems, are described in detail -- as well as the procedures resulting in the quantative size and mass distribution of such aerosols. Experiments of exploratory nature are discussed which demonstrate that su ch reaction products form temporary condensates on artifically introduced particulates whenever present during photoactivation.

06325

Schlier, R., R. Penndorf, H. Ceccon, E. Neister, H. Dolazalek, and J. Culbert

A STUDY OF METHODS TO MEASURE THE EFFECTS OF A CONTAMINATED ATMOSPHERE ON THE TRANSMISSION OF A HIGH ENERGY LASER BEAM. (FINAL REPORT.) AVCO Missiles, Space, and Electronics Group, Wilmington, Mass., Space Systems Div., Contract

DA-18-001-AMC-957(X), AVSSD-0183-67-RR, 138p., May 1967.
6 refs.
CFSTI, DDC: AD 654786

The laser system used is composed of an oscillator-amplifier system. The oscillator utilizes a 5/8 by 6 inch, flat-ended, ruby rod pumped by four EG+G FX 47 flash lamps in a multielliptical cavity. The flash lamps are energized by a pulse-shaping network that shapes the input electrical energy. A simple aerosol generator was developed that uses concentrated hydrochloric acid and ammonia hydroxide. By mixing these vapors, ammonium-chloride salt is formed consisting of fairly uniform particles of sizes normally under a micron. The experimental chamber designs were constructed of 2-inch-diameter Pyrex tubing of various lengths. The measurement of attenuation of the laser beam is discussed. Typical beam profiles that were constructed by using a photographic technique are presented. The creation of an aerosol of stable concentration is discussed. Laser firings were carried out at various peak powers. The upper curve is the optical density of latex sphere aerosol at the time of peak laser power. In the vicinity of one billion watts/sq cm, the optical density undergoes a sharp increase. The latex spheres, at breakdown, produce an ionized vapor. Since this ionized vapor can trigger an air breakdown, the sharp increase in attenuation is to be expected. Boron indicated a decrease in attenuation as the power was increased. Boron particles are very small compared to a wavelength of light. They are small enough so that they would be partially evaporated by the laser energy, but the vapor thus created would not become absorbing. No breakdown effect was noted when the boron was used.##

06382

Inhalt, D. H.

METHANE IN THE ATMOSPHERE. J. Air Pollution Control Assoc., 17(8):518-519, Aug. 1967. 13 refs. (Presented at the 60th Annu. Meeting Air Pollut. Contr. Assoc., Cleveland, Ohio, June 11-16, 1967.)

Methane is present in the troposphere with a volume concentration of about 1.5 ppm. Estimates of Koyama (1963) indicate a predominantly biological origin with a total production rate of about 2.7 times 10 to the 14th power g CH4 per year; he estimated the atmospheric lifetime of methane to be around 20 years. Measurements of the C-14 in methane by Libby and later by Bainbridge et al. (1961) gave a -14 content of 75% of recent wood and, therefore, confirm the predominant biological origin, the addition of inactive CH4 from industrial sources being only about 25%. Much less is known about atmospheric sinks of CH4. Cadle (1966) reported fairly high destruction rates by atomic O, a reaction which should be important at high altitude. Bainbridge (1966) indeed reports a decrease in the measured methane concentration above the tropopause. He, however, considers this decrease too small to account for the destruction rate of 20 years estimated by Koyama. Our measurements on air samples collected on

aircraft flights at various altitudes show a high variability of the CH4 content both with time and altitude. (Author abstract)##

06480

E. Turner, D. M. J. Compton, and J. W. McGowan

ELECTRONIC AND IONIC REACTIONS IN ATMOSPHERIC GASES (YEARLY TECHNICAL SUMMARY REPT. SEPT. 1, 1965-AUG. 31, 1966). General Dynamics Corp., San Diego, Calif., General Atomic Div. 83 pp. (Nov. 14, 1966) (Rept. Nos. DASA-1863 and GA-7419.)
CFSTI, DDC: AD 643 093

The explosion of a nuclear device in the atmosphere results in a high degree of ionization in the surrounding atmosphere. Because the free electron concentration corresponding to this ionization largely controls the transmission of radar and radio waves, the manner and rate with which the free electron concentration decreases is under intensive investigation. The electrons are lost by recombination with ions and by attachment to neutrals; these processes have rates which may vary by several orders of magnitude, depending strongly upon the identity of the positive ion or the neutral species with which the electron combines. The cross sections for charge transfer in collisions between nitric oxide and atomic and molecular positive ions of oxygen and nitrogen have been measured in the energy range from 3 to 200 eV in a crossed beam experiment. A technique to determine the fractional concentration of the excited ions in an ion beam as a function of source electron energy has been developed. The determination is made approximately 20 micron seconds after formation of the ions, so that only long lived states remain in the beam. Basically, the method consists of attenuating the ion beam in a gas-filled chamber where, in general, the excited ion attenuation is different from the ground-state ion attenuation. The study was completed for the case of an O_2^+ ion beam, and only one excited state appeared to be important. (Author abstract)##

06481

J. L. Karney, D. A. Lea, and C. A. Knudsen

LASER RADAR RETURNS FROM THE LOWER TROPOSPHERE COMPARED WITH VERTICAL OZONE DISTRIBUTIONS. Pacific Missile Range, Point Mugu, Calif. (Mar. 27, 1967). 11 pp. (Rept. No. PMR-TM-67-2.)
CFSTI, DDC: AD 649 700

The ambient atmospheric structure was delineated by various direct conventional and nonconventional measurement techniques to permit empirical interpretation of the laser returns. From May through December 1965, a series of ozone soundings were conducted at Point Mugu using balloon-borne chemiluminescent ozonesondes. The soundings frequently revealed significant ozone in the lowest

few kilometers, presumably associated with occasional influx of polluted air from the Los Angeles Basin 50 to 150 kilometers to the east. The ozone profiles are compared with simultaneous aerosol-backscattered returns from a laser beam. Preliminary comparisons of laser radar returns with vertical ozone distributions in the lower troposphere suggest an inverse relationship, especially in smoggy air advected from the nearby Los Angeles Basin. Enroute to the observing site, the ozone content of the polluted air is presumably depleted in discrete layers by destructive contact with stratified layers of aerosol and cloud from which the laser pulses are backscattered.##

06503L

I. Cantor and A. Petriw

ATMOSPHERIC LIGHT TRANSMISSION IN A WISCONSIN AREA. Army Electronics Command, Fort Monmouth, N.J. Atmospheric Physics Division. (Tech Rept. ECOM-2726.) (#JUNE 1966). 71 pp.

Air to surface transmission measurements were carried out to help fill a gap caused by unavailable data on total and direct transmittances from a point light source over relatively long slant ranges and low altitudes in a real atmosphere with and without cloud cover and over two widely different surface albedos. This information is necessary to ascertain probable thermal radiation damage criteria under diverse weather and geometry conditions. Air to surface transmission measurements were carried out to maximum slant range of 100,000 yards at different altitudes and weather conditions over Lake Michigan and Wisconsin farm land during March 1965. Total transmittance versus slant range for the visible and near infrared regions is introduced as smoothed, average curves and simplified exponential equations representing the least square fit to the experimental data under specific weather conditions. Peak transmittances in excess of 200 percent are observed under cloud-snow surface conditions alone. Criteria for evidence of surface albedo differences are introduced, from which limited albedo effects are noted under cloudy, snowcovered surface conditions. The relationship between the total and direct attenuation coefficients can be simply expressed for clear sky conditions, good to excellent surface visibilities, and zero to about 80 percent snow cover. (Authors' abstract, modified) ##

06604

K. W. Wilson

NITROGEN OXIDES AND PHOTOCHEMICAL SMOG FORMATION - A LITERATURE SURVEY. California Univ., Los Angeles, Dept. of Engineering. (May 1962.) 20 pp. (Rept. No. 62-20.)

Considerable work has been done to elucidate the role of

hydrocarbons in photochemical smog formation. In contrast, no concentrated effort has been made to study the details of the reactions of the nitrogen oxides. Using a summary, by Leighton, of all of the significant work to date on the chemistry of smog formation, the attention is focused on the nitrogen oxides. An attempt is made to learn about the conversion of nitric oxide tc nitrogen dioxide, studying the role of hydrocarbons, photochemical characteristics and possible reaction paths of the reaction. Also questioned is the influence of non-hydrocarbons on the rate of oxidation. The reactions of nitrogen dioxide to form stable end products were studied. Included are the chemical structures of these end products and the mechanism involved in NO2 disappearance. Up to the present time, no experiments simulating smog formation have been performed in which all of the nitrogen oxides present initially could be accounted for in terms of final products which were identified and measured. This may indicate that unknown compounds are formed or merely the lack of precision in measurements. On the basis of the present evidence, it appears that nitric acid, alkyl nitrates and acyl and peracyl nitrates are the most probable reaction products.##

06632

A. Goetz and R. Pueschel

BASIC MECHANISMS OF PHOTOCHEMICAL AEROSOL FORMATION. Atmos. Environ. 1, 287-306 (1967).

A photochemical reactor was applied to studies of the effects of sulfur dioxide humidity, and order of mixing of reactants on the photochemical production of aerosol from 1-octene and nitrogen dioxide in air. The effects of all three parameters are complex but explainable from a few reasonable assumptions, the most important of which is probably that initial contact between the aerosol nuclei and the more polar reactants has a governing effect on the nature of the product. The experimental results presented are obviously still lacking in sufficient detail for formulation of an adequate description of the complex reaction patterns which lead to the formation of photochemical aerosols in the presence of SO2 under various humidity conditions. Nevertheless, the data definitely indicate that the presence of stable particulates is a dominant factor, not only as centers of accumulant formation, but also as loci for the concentration of reactant gas molecules (H2O, NOx, SO2) in their immediate environment. The subsequent photoactivation will thus be more efficient at these centers than in the free volume between them. The existence of such localized statistical "order states" appears to be the most likely interpretation for the effect of the contact sequence order between reactants and particles.##

06777

(CHIMNEY PLUME RISE AND DISPERSION.) Elevation des Panaches de Fumees et Dispersion. Centre Interprofessionnel Technique d'Etudes de la Pollution Atmospherique, Paris,

France. (1967.) 5 pp. Fr. (Rept. No. CI 316.)
(C.I.T.E.P.A. Document No. 24.)

The symposium held at Letherhead, England on October 7, 1966 on chimney plume rise is reported which includes two surveys of the SO2 in the neighborhood of electric power houses and the chimney plume rise under various meteorological conditions. The height of the plume was measured in one case by the signal reflected from the plume of a luminous beam directed at the plume from the ground. The reflection is measured by a photoelectric cell on the ground. The use of lidar, which uses a laser beam instead of light permits the observation of an invisible plume 1200 meters from the source. It also detects the level of inversion. The lidar permits the total scanning of a plume in 3 min. The SO2 values for dispersion were made for different plume heights, but were not given. Two formulas were derived; one gives the height of plume of smoke and the other the maximum concentration at ground level.##

06785

K. Kato

IONS IN AIR: 2. IONS AND AIR POLLUTION; AND 3 - IONS AND PUBLIC HEALTH. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo) 2 (1), 48-53, 1964. Jap.

In Part 2 of the study on ions in air, data are given on the relations between ions, dusts, exhaust gas, and smoking. The author measured dust, CO2, and small positive and negative ions at five locations. Generally, in industrial areas there is a greater concentration of positive ions than negative ions and the reverse is true for residential areas. It is graphically illustrated that the amounts of CO2 and dust present in the air are directly proportional to each other but the quantities of dust and ions present are inversely proportional. As for exhaust gas, an experiment; was performed in which gas was released into a room for 10 min. The ion concentration was reduced from 1110/cc to 120/cc. Other experiments indicate that the presence of people in a room diminishes the number of ions. Also, it was shown that in air conditioned rooms twice as many small ions are present as in outdoor air. As for filters, the concentration of small ions was reduced to about one tenth by using polyethylene and vinyl filters and to one fifth or one third by polyurethane and glass fiber filters. In Part 3, the relation between ions and heating devices is covered, mentioning the infrared oven, gas stove, and electric stove. Some mention is made of the effects of ions on the human body. The ion concentrations of some hot springs are given indicating that from seven to twenty times as many ions are present in these areas compared to city environment.##

06839

R. A. Prindle

LONDON TRIP REPORT DECEMBER 1962 DURING A SMOG EPISODE. Preprint. (1962).

This report is a result of a trip, of ten days duration, made to London during a smog episode there which had resulted in deaths and increased illness. The report represents the opinion of the trip reporter. The conclusion is reached that SO2 values were about as high as those in 1952, but smoke was considerably reduced. Several factors appear to be operating which produce this result: (1) the meteorolcgical conditions were similar to 1952, (2) fuels used still have high sulphur content, (3) more "smokeless fuels" are in use as the result of the Clean Air Act, and (4) social and technical changes have resulted in new, tall buildings with central heating plants. The mortality and morbidity were substantially lower than in 1952. This is partially a result of the shorter duration of the episode, but it is evident that this alone could not account for the reduction. There is evidence, herein presented, and supported by laboratory studies at Harvard showing that aerosols affect the ability of SO2 to produce deleterious effects on animals, to lead to the conclusion that the marked reduction in smoke was an important factor in the diminution of human distress and death.##

06841

B. J. Steigerwald and D. A. Lynn

AIR IONS AS AN INDEX OF AIR POLLUTION. Preprint. (1962).

This report details the results cf an 18 month investigation of the effect of air contaminants on atmospheric ions. The relationships between air contaminants and atmospheric icns were studied both by the use of field sampling activities and through controlled laboratory investigations. Results indicate that urban air contains high concentrations of intermediate and large ions and low concentrations of small ions compared to rural atmospheres. The positive large ion concentration was used to study quantitatively the relationship between air contaminants and atmospheric ions. The data were analyzed statistically using correlation and regression methods. Temperature, humidity, CO2 and SO2 at ambient concentrations had no effect on large ions. Large ion concentration correlated only silghtly with particulate stain concentration, but correlated very strongly with automobile exhausts. It appears that in complex urban atmospheres the concentration of autcmobile exhaust is the dominant factor in the alteration of natural atmospheric ion levels. (Authors' abstract) ##

06916

A. J. Dyer

ARTIFICIAL RADIO-ACTIVITY, OZONE AND VOLCANIC DUST AS ATMOSPHERIC TRACERS IN THE SOUTHERN HEMISPHERE. Tellus (Uppsala), 18(2):416-419, 1966. 12 refs. (Presented at the CACR Symposium on Atmospheric Chemistry, Circulation and

Aerosols, Visby, Sweden, Aug. 18-24, 1965.)

The use of artificial radioactivity measurements to study atmospheric transfer processes is particularly attractive in the Southern Hemisphere because of the absence of atomic testing at other than equatorial regions. Observations of volcanic dust at Aspendale (38 degrees S) following the Bali eruption of 1963 show that the bulk of the material arrived in these latitudes after about six months at a height of 20 km. Simple diffusion theory would imply a horizontal transfer coefficient of 4 x 10 to the 9th power cu. cm. sec/1. A similar value would be inferred from the initial appearance of artificial radioactivity in rainfall following the 1962 series of atomic tests at the equator. However, stratospheric sampling carried out at Mildura (35 degrees S) indicates the poleward transfer of fission products to be rather complex. The first arrival after about six months is well demonstrated at a height of 18 km; but other, stronger centers of activity appeared at 33 km after 6 to 9 months, and at 25 km after 12 months. Seasonal effects are observed in all tracers, but with the various maxima occurring at slightly different times of the year, presumably due to the different height involved in transfer from an equatorial reservoir. (Author's abstract) ##

06918

W. S. Hering

OZONE AND ATMOSPHERIC TRANSPORT PROCESSES. Tellus (Uppsala) 18 (2), 329-36 (1966). (Presented at the CACR Symposium, Atmospheric Chemistry, Circulation and Aerosols, Visby, Sweden, Aug. 18-25, 1965.)

A systematic program to measure vertical ozone distribution was established by the Air Force Cambridge Research Laboratories in January 1963. High resolution measurements with the Regener chemiluminescent ozonesonde have been obtained from a network of twelve stations in North America, which extends from the Canal Zone to the Arctic region. Processed data from the first two years of network operation were used to analyze the broad-scale characteristics of the ozone distribution. Detailed meridional cross sections of ozone mixing ratio were constructed and compared with simultaneous distributions of other atmospheric tracers including potential vorticity and radioactive debris. The striking consistency in the behavior of these tracers, each having quite different sources and sinks, suggests that the extratropical lower stratosphere is strongly stratified but on the average remains well mixed along surfaces which have a significant slope downward toward higher latitudes. To a good first approximation in all seasons, trace substances in this region of the atmosphere tend toward a uniform distribution along surfaces of constant potential vorticity. Direct computations of the temporal eddy ozone flux indicate that the northward transport across middle latitudes over North America occurs predominately at the base of the stratosphere near the tropopause. The average flux strength observed in the summer and fall seasons is less than one-third of the average winter and spring transport.##

06925

R. Siksna

THE RECOMBINATION OR COMBINATION TIME IN EXPRESSIONS FOR VOLUME RECOMBINATION AND COMBINATION OF AIR IONS AND OTHER AEROSOL PARTICLES. Tellus (Uppsala) 18 (2), 619-22 (1966).
(Presented at the CACR Symposium, Atmospheric Chemistry, Circulation and Aerosols, Visby, Sweden, Aug. 18-25, 1965.)

Mathematical expressions for the volume recombination coefficient of air ions and aerosol particles were derived.##

06982

L. Elterman

AEROSOL MEASUREMENTS IN THE TROPOSPHERE AND STRATOSPHERE.
Appl. Opt. 5 (11), 1769-76 (Nov. 1966).

Light scattering measurements from a searchlight beam were carried out in New Mexico to determine the aerosol properties of the atmosphere. Although data were acquired to an altitude of about 70 km, the results show the aerosol attenuation parameters to be significant to about 35 km. The expression for the aerosol attenuation coefficient is derived based on the field geometry in conjunction with Rayleigh and aerosol scattering considerations. The results are categorized into moderate-structured aerosol profiles. Examples of each are discussed and measurements presented which show variation over a 6-h period. A quantitative examination is made of the 20-km aerosol layer. Also, a medium-structured profile is selected and treated more extensively to provide preliminary information pertaining to atmospheric scattering and transmission. Ultimately, the data accumulated will provide a substantial number of profiles that will form a basis for various atmospheric studies. (Author's abstract)##

06993

S. Millman, W. Tank, J. Pressman

STUDY OF PERTURBATIONS IN IMPORTANT UPPER ATMOSPHERIC CHEMICAL SYSTEMS. Geophysics Corp. of America, Bedford, Mass.
(Dec. 1962). 55 pp. (GCA Technical Rept. No. 62-5-G.)
(Scientific Rept. No. 4.)

A fundamental preparation is presented for a later phase of machine computation of some of the basic photochemical systems of the upper atmosphere which may be perturbed by rocket pollution. The present knowledge of these systems and their equilibrium in the upper atmosphere is reviewed. The oxygen system, the hydrogen-oxygen system, the nitrogen-oxygen

system and the carbon-oxygen system have been analyzed. Of these it is felt that only the latter is at present not suitable for machine computation. Some computations (hand) are presented for the hydrogen-oxygen system at extreme altitudes where atomic hydrogen dominates and also some calculations have been performed with improved rate constants for the nitrogen-oxygen system.##

06994

S. Millman, G. Pressman, P. Warneck

OZONOSPHERIC MODIFICATION BY MISSILE EXHAUST. Geophysics Corp. of America, Bedford, Mass. (GCA Technical Rept. No. 62-14-G. Scientific Rept. No. 9.) 65 pp. (Dec. 1962).

A possible consequence of the increased launching of large rocket missiles is the large-scale local or worldwide modification of the atmosphere, in particular the occurrence of perturbations that might disturb the existing equilibria by causing chain, cyclic, or catalytic processes. This report considers these possible missile exhaust chemically induced changes in the ozonosphere, the lower reactive portion of the atmosphere. The possibility of chain, cyclic or catalytic processes initiated by one of the components in a rocket's exhaust trail that might cause appreciable changes in the composition of the atmosphere is studied. Chain, cyclic, and catalytic type processes are of greatest interest since destruction (or creation) of ozone on the basis of 1 molecule of ozone per molecule of initiating material would require immense amounts of material released into the atmosphere. In particular, possible reactions that occur when large quantities of OH or H radicals are uniformly released into the atmosphere at a height of 30 kms from hydrocarbon - lox systems are considered. Suggestions for experimental work are made in order that some of the preliminary estimates may be rendered less tentative. The results obtained indicated that large scale perturbations of the ozonosphere are possible under certain circumstances.##

07000

L. Elterman

AN ATLAS OF AEROSOL ATTENUATION AND EXTINCTION PROFILES FOR THE TROPOSPHERE AND STRATOSPHERE. Air Force Cambridge Research Labs., L. G. Hanscom Field, Bedford, Mass., Optical Physics Lab. (Rept. No. AFCRL-66-828.) Dec. 1966, 134 pp.

Light scattering measurements were carried out to determine the aerosol properties of the atmosphere. First the expression for the aerosol attenuation coefficient is derived, based on the field geometry in conjunction with Rayleigh and aerosol scattering considerations. Then the results derived from the measurements are discussed. The paper concludes with an atlas of 105 profiles

for altitudes to about 35 km (the data does not exclude the presence of aerosols with low number density between 35 to 80 km). These profiles consist of aerosol attenuation and extinction coefficients as a function of altitude. Since the coefficients are proportional to aerosol number density, the profiles yield information concerning aerosol stratification. A plot for the computed mean of the 105 vertical profiles is included. (Author's abstract)##

07198

Y. Kawanami

AIR POLLUTION IN TOKYO. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 4(2):11-22 (July 1966). Jap.

A definition of smog is given as the restriction of visibility to less than 2 km in the city and vicinity, excluding the restriction by rain. Out of 154 days when smog occurred in Tokyo in 1965, 64 were caused by heavy fumes and 90 by mist or haze. The differences in times of occurrence of heavy fume-type smog and mist or haze-type smog is discussed. The yearly variation of the number of "smog days" is graphed indicating seasonal influences. Smog decreases in winter but increases in summer and fall. The current status of air pollution in Tokyo is also covered with respect to dust and soot fall, floating dust, sulfuric acid, nitrogen oxides, hydrocarbons, and lead compounds. Measurement of dust and soot fall in Tokyo began in 1955 and yearly variations are graphed through 1965. Dust fall reaches a peak between February and May and then again in August and September. These peaks are related to the meteorological influence of strong winds in spring and large amounts of rain in spring and late summer. Therefore, July and December are considered the best times to investigate air pollution without meteorological influence. Lengthy discussion is given to daily and hourly variations of pollution peaks in urban, industrial, and suburban areas.##

C7257

Khan, A. U., J. N. Pitts, Jr., and E. B. Smith

SINGLET OXYGEN IN THE ENVIRONMENTAL SCIENCES: THE ROLE OF SINGLET MOLECULAR OXYGEN IN THE PRODUCTION OF PHOTOCHEMICAL AIR POLLUTION. ((Environ. Sci. Technol.)), 1(8):656-657, Aug. 1967. 14 ref.
CFSTI; DDC 675 969

A new mechanism is proposed to explain the rapid conversion of NO into No 2 with a concurrent disappearance of hydrocarbons and appearance of oxidants in photochemical air pollution. Singlet oxygen generated by triplet energy transfer from strongly absorbing polynuclear aromatic hydrocarbons to normal oxygen produces excited singlet molecular oxygen which attacks olefins to

give unstable peroxides. A mechanistic chain is set up involving free radicals generated by decomposition of these peroxides. A solution of differential equations relating to the proposed mechanism yields a set of rate-time curves for NO-NO2-O3 which have the same general characteristics as those observed in actual smoggy atmospheres. The presence of singlet oxygen in urban atmospheres has potentially great implications in the environmental sciences. (Authors' abstract)##

07264

Juda, J. and K. Budzinski

ATMOSPHERIC POLLUTION. ((Zanieczyszczenia Atmosfery.)) Text in Polish. Wydawnictwa Naukowo-Technicznе, Warsaw, 1961, 256 p. 29 refs. Engl. transl. by JPRS: 18,455, Mar. 31, 1963.
OTS: 63-21460

Information about the sources, dispersion and investigation of atmospheric pollutants is reported. Results of studies from foreign sources are given, and an attempt is made to analyze these data in the light of conditions prevailing in Poland. The work is intended for engineers who plan industrial plants and supervise the operation of machinery and industrial installations, as well as for the safety and work hygiene service employees. Subjects discussed are: (I) Systematic Classification of Atmospheric Pollutants; (II) Sources of Atmospheric Pollutants; (III) Damage Caused by Atmospheric Pollution; (IV) Aerosol Mechanics; (V) The Influence of Meteorological Conditions on the Dispersion of Pollutants; (VI) Dispersion of Pollutants in the Atmosphere; (VII) Methods of Measuring Atmospheric Pollution; (VIII) Determination of Pollutant Emission; (IX) Estimation of Dustfall; (X) Determination of Particulate Matter Concentration; and (XI) Determination of Gaseous Air Pollutants.##

07310

Fedorov, M. M.

EFFECT OF SMOKE ON CITY LIGHT. Gigiena i Sanit., 23(8):14-18, 1958. 9 refs. Translated from Russian by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 213-217, March 1960.
CFSTI TT60-21188

In 1950 - 1953 a study was made of light conditions of the town of Zaporozh'e by determining factors which affected total light absorption and degree of dispersed light absorption. The studies were made with the aid of photoelectric luxometers equipped with selenium photoelements designed by the U. S. S. R. Academy of

Sciences. The luxometers were standardized at the Institute of Physics at the Academy. The stadium "Locomotive" and the physical training grounds of the Pedagogical Institute, located in the old section of the twon, constituted the basic centers of observations, where illumination intensity measurements were made systematically at 9, 12, and 4 o"clock. Another observation point of illumination intensity was located on the grounds of the steel plant Zaporozhstal. The control observation point of light intensity was located in village Kushugum 25 kilometers from the factory grounds. Illumination determinations at these points were made at the same hours of the day. The height of the sun over the horizon, atmospheric clarity, the shape and number of clouds, the presence of snow on the ground, etc., all have an effect on the intensity of natural light striking a horizontal surface. The interaction between the factors mentioned determines the annual course of noon-day illumination intensity. Data shows that the total illumination in the region of villages surrounding the metallurgical plant grounds was lowered by the smoke by 5 - 18% as compared with the total illumination of the old section of the town; the total illumination of the latter, in turn, was lowered by 5% as compared with the suburban total illumination; therefore, it can be stated that total illumination of the factory villages was 8 - 20% below the total illumination of the control observation points. These are only average values. It should be noted that shifts in the wind direction considerably affected total illumination of any particular observation point or locality. In the data presented in this report such effects were taken into consideration.##

07456

Wagman, Jack

CURRENT RESEARCH ON ATMOSPHERIC SULPHUR COMPOUNDS AND THEIR TRANSFORMATIONS. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organization for Economic Co-operation and Development, Paris Directorate for Scientific Affairs, Paper 1, Dec. 1967, p. 1-15. 17 refs.

All aspects of the disposition of sulfur compounds in the atmosphere are of great importance in view of the vast quantities of these materials that are being emitted into the air. Previous studies on mechanisms for the oxidatrion of SO2 in the atmosphere and of its possible involvement in photochemical reactions with hydrocarbons and oxides of nitrogen lead to the conclusion that oxidation may proceed by several types of reactions with the predominant route governed by the prevailing conditions of concentration, humidity, temperature, presence of other pollutants, incident radiation, terrain, etc. A few of the relevant research projects now underway are selected for discussion. These include (a) a study of the particle-size distribution of suspended sulfate particulates in urban air with an evaluation of the influence of some atmospheric variables, (b) studies of interactions between gases, especially SO2, and particulates,

(c) an investigation to define the reactions that sulfur compounds undergo in stack plumes from coal- and oil-burning power plants, and (d) the development of a metal-film technique for the identification and size analysis of acid aerosol droplets.##

07518

Yantovskii, S. A., I. Yu. Sidorina, and M. V. Chernyak

CONDITIONS OF SAFE OXIDATION OF TOLUENE BY ATMOSPHERIC OXYGEN. Text in Russian. Neftekhimiya, 6(1):105-111, 1966. 22 refs. Engl. transl. Intern. Chem. Eng., 7(1):144-149, Jan. 1967.

The maximum permissible amount of oxygen and the limiting temperature to assure safe conditions for the liquid-phase oxidation of toluene at pressures from 1 to 20 atmospheres was determined. In order to assure safe conditions for the liquid-phase oxidation of toluene on an industrial scale it is necessary to maintain minimum oxygen concentration after the reactor at about 6%. In order to maintain a constant safe concentration of the toluene + air mixture in the reactor, in which the amount of oxygen can be brought up to 21%, it is necessary to maintain the temperature above the limiting temperature. At 10 atm. the temperature of the reactor should not be less than 130 deg. This value is 35-45 deg below the oxidation temperature of toluene, which is recommended for the optimum conditions.##

07693

Kettner, H., W. Altvater, H. Gronzig, and H. Spelleken

ON THE INFLUENCE OF WEATHER CONDITIONS ON THE CONCENTRATION OF SUSPENDED PARTICULATES IN FREE AIR. ((Uber den Einfluss der Witterungsbedingungen auf die Schwebestaubkonzentration in der Aussenluft.)) Text in German. Stadtehygiene (Uelzen/Hamburg), 15(6):125-128, June 1964. 14 refs.

Particulates with diameters between 0.5 and 5 microns are of special medical and hygienic importance because of their deep penetration into the lung. In Duisburg, dust measurements were made from May until December, 1962, with a konimeter which retains only particles in the indicated range of sizes. The measurements were made in five series. For each measurement the weather conditions are described and the average particle number per cubic centimeter is reported. Some measurements were made in the windward side and the leeward side of dust emitting industries. As a result, a marked relationship between the weather and the dust concentrations was found. Up to 1000 particles/cu m were found during a smog situation, while the average number of particles in normal weather was 200/cu m. The dust concentration was found to be uniform over the city except near dust emitting industries.

Maximum allowable concentrations are cited. It is noted that while there are maximum allowable concentrations for work areas, there are none for the open air.

07701

Stante, C., N. Virtu', and A. Vitti

RESEARCH ON THE HYDROATMOSPHERIC POLLUTION OF THE CITY OF TARANTO. ((Indagine Sull'inquinamento Idroatmosgerico Della Citta di Taranto.)) Text in Italian. Fumi Polveri (Milan), 7(5):1-2-108, May 1967. 18 refs.

The degree of air pollution and the effects of micrometeorological conditions are reported. The quantities and the composition of settling materials are tabulated in tons/sq km month for summer and winter of 1965 and 1966. The locations of three sampling stations are given on a map and data are given for each site. One was in an industrial section. Some of the materials collected were ashes, Ca, Fe, Mn, and silicates. The diameter of the particulates varied between 1 to 5 microns. More than 50% measured less than 1 micron. The gaseous pollutants were SO2, H2S, CO, and traces of N. (Hydrocarbons were not investigated.) The Gulf of Taranto forms a "small sea" and the composition of the water in the sea (the big sea) and the Gulf (the small sea) was studied also.

07716

Hampson, John

ATMOSPHERIC ENERGY CHANGE BY POLLUTION OF THE UPPER ATMOSPHERE. Canadian Armament Research and Development Establishment, Valcartier, Canada, Proj. D48-95-10-42, TR-1738/66, 14p., Nov. 1966.
DDC: AD 810790

The problem of upper atmospheric pollution is reexamined on the basis of chemical kinetics postulation in which water vapor products are found to play a dominant role in controlling the component of atmospheric energy balance due to oxygen allotropes. It is noted that pollution from rockets carrying relatively exotic materials into the upper atmosphere may be important, but in general rockets do not pollute the atmosphere. aircraft, specifically supersonic transports, may be a more important problem for the future. (Author's abstract)

07872

E. W. Hewson, L. E. Olsson

LAKE EFFECTS ON AIR POLLUTION DISPERSION. J. Air Pollution Control b8assoc. 17(11):757-761, Nov. 1967. 15 refs. (Based on a paper presented at the 6th Annual Sanitary and Water Resources Engineering Conference spcnsored by Vanderbilt Univ. and the Tennessee Dept. of Public Health, Nashville, Tenn., June 1-2, 1967.)

Local wind regimes induced by a lake or a shoreline may have a major influence on air pollution dispersion. Pressure differences due to differential heating of the air, e.g., that due to differences in surface characteristics, are the driving forces of lake and land breeze circulations and slope and valley winds. Differences in roughness between land and lake surfaces will cause wind shear and aerodynamic downwash effects at a shoreline. Stability changes in the air result from differences in surface temperature and roughness between land and lake, e.g., when warm unstable air moves out over a cool lake a temperature inversion will develop near the surface giving very poor dispersion conditions in this lower layer. Pollution released in this stable layer may be carried in high concentrations for many miles and cause severe damage as the air moves across a down wind shoreline and advances inland. The information presented is designed to permit an assessment of the probable complexity of the dispersicn patterns near a shoreline so that possible requirements for additional metecrolcgical and dispersion information may be determined. Brief descriptions of twc actual lakeside sites, one on Lake Erie and the other on Lake Michigan, are given and their relevant characteristics are presented. Natural ventilation was above averate at both sites. (Authors' abstract) ##

07976L

Bojkov, R. D.

VERTICAL DISTRIBUTION OF OZONE IN THE EARTH'S ATMOSPHERE. Meteorol. i Gidrol., No. 10:3-11, 1965. 20 refs. Engl. transl. by Georgia Inst. of Tech., Atlanta, Engineering Experiment Station, Contract AF 19(628)-5034, G.T.R. 66-22, 20p., Oct. 1966.
CFSTI, DDC: AD 812927

The average vertical distribution of ozone along the meridian, and its seasonal variation, based on more detailed data obtained in recent years are considered. The layer with the highest concentration and the highest percentage content of ozone is on the average 26 km at the equator and 19 km in the polar regions. The most significant variations of concentration and percentage content of ozone are observed in the layers below 25 km. The layer of greatest ozone concentration increases in depth very rapidly from the tropic zone northward, drops down toward the tropopause, and includes the middle as well as the lower stratosphere, especially in winter - spring. The major variation in total ozone content in extratropical latitudes is identified with the variation in the layers below 25 km. These results can be used to check models of stratospheric circulation, the characteristic pattern of which is

given in other works, and these largely agree with the views expressed by Kh. P. Pogosyan. The data on ozone variation confirm the presence of meridional transport, directed toward th5 pole in the middle stratosphere, mainly in winter and spring. Intensive descending motions lead to an abrupt increase of ozone north of the subtropics and in polar latitudes at layers below the concentration maximum. Summer and autumn meridional transport is weaker and sometimes is even directed from pole to equator. At this time descending motion in the lower stratosphere introduces ozone into the troposphere, where it is destroyed more quickly by oxidation processes. Upward motion into the part of middle and upper stratosphere in polar regions conducts ozone to levels above 30-33 km. where it is destroyed photochemically. Thus, even if only qualitatively, confirmation of an approximate model of stratospheric circulation is obtained.##

08197

Bushtuveva, K. A.

RATIO OF SULFUR DIOXIDE AND SULFURIC ACID AEROSOL IN ATMOSPHERIC AIR, IN RELATION TO METEOROLOGICAL CONDITIONS. Gigiena i Sanit., No. 11:11-13, 1954. 6 refs. Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 193-196, Aug. 1960.
CFSTI: TT 60-21913

The atmosphere of Moscow was analyzed for the presence of sulfuric acid aerosol in an attempt to determine whether or not its presence was in any way related to the oxidation of sulfur dioxide. At the same time an attempt was made to determine what correlation, if any, existed between the concentrations of these two air pollutants and to find the conditions which determined their ratios. One-hundred-ninety-eight 24 hour samples and 50 single concentration samples were collected simultaneously. A study was also made of the relations between the ratio of H_2SO_4 aerosol and SO_2 concentrations and meteorolcgical conditions, such as relative humidity, velocity of wind and the type of weather. The results of the investigation agree with the assumption that sulfuric acid aerosol can accumulate in the atmosphere of a city during calm foggy days.##

C7980

Griggs, M.

ATMOSPHERIC OZONE. In: A. E. S. Green, (ed.), The Middle Ultraviolet: Its Science and Technology, New York, John Wiley & Sons, 1966, Chapt, 4, p. 83-117. 86 refs.

A review of atmospheric ozone is presented. Optical properties of ozone, photochemical theory of atmospheric ozone, methods of measuring atmospheric ozone, observed characteristics of

atmospheric ozone, further considerations of atmospheric ozone and effects of solar heating and cooling on the radioactive equilibrium temperature structure of the earth are discussed.##

C8330

Jaffe, L. S.

PHOTOCHEMICAL AIR POLLUTANTS AND THEIR EFFECTS ON MEN AND ANIMALS. I. GENERAL CHARACTERISTICS AND COMMUNITY CONCENTRATIONS. Arch. Environ. Health, Vol. 15, p. 782-791, Dec. 1967. 88 refs.

The physical and chemical characteristics of photochemical smog and the photochemical oxidants are described. Aerometric data on the "total oxidant" concentrations found in the large urban communities affiliated with the Public Health Service, Continuous Air Monitoring Program (CAMP) network are documented for 1964 and 1965. Similarly, the number of days on which the "total oxidant" concentrations equalled or exceeded 0.05, 0.1, and 0.15 ppm, respectively, has been delineated for each of the affiliated cities in this network. The 0.05 ppm and 0.1 ppm levels are routinely found and are exceeded in all of the cities affiliated with this network for highly significant percentages of days of the year, while the 0.15 ppm level is exceeded only in Los Angeles thus far for a significant percentage of the total number of days of the year. However, much higher maximum hourly and maximum five-minute levels are attained in all of the cities (but one) during the year. (Author's summary, modified)##

08625

Angell, J. K., and H. Korshover

BIENNIAL VARIATION IN SPRINGTIME TEMPERATURE AND TOTAL OZONE IN EXTRATROPICAL LATITUDES. Monthly Weather Rev., 95(11):757-762, Nov. 1967. 10 refs.

During the past decade in extratropical latitudes, springtime stratospheric temperatures tended to be relatively high during the even years and relatively low during the odd years, with some evidence for a phase reversal in the troposphere. In the Southern Hemisphere this even-year stratospheric temperature excess appears to have progressed poleward with time, with the maximum excess occurring near the Tropic of Capicorn in 1955 and near the Antartic Circle in 1965, where the excess averaged 8 C. even at 100 mb. Total ozone measurements in both hemispheres tend to confirm such a poleward trend. Furthermore, in agreement with a period of order 20 yr. implied by the stratospheric temperature differences, the difference between (springtime) even-year and odd-year total amounts at Arosa, Switzerland, exhibits a 20-yr. periodicity from 1928 to 1966, with ozone amounts averaging 10 percent higher during the spring of the even years around 1960. Springtime surface

temperatures in Scandinavia have undergone a similar (15-to 20-yr.) periodicity since 1850, with odd-year temperature excesses averaging 2 deg C. around 1959. After 1920, European stations exhibit like variations, but there is little evidence for such surface-temperature fluctuations in North America or in the tropical and temperate latitudes of the Southern Hemisphere. It is suggested that there is an asscciation between the cycling interval of the quasi-biennial tropical oscillation and the above fluctuations of period of order of 20 yr. AA.

08744

Chamberlain, A. C.

RADIOACTIVE AEROSOLS AND VAPOURS. Contemp. Phys., 8(6):561-581, 1967. 11 refs.

Radioactive substances may be present in air as dust, fume, or vapor, very often they are attached to the natural aerosol (salt, soil rock products, volcanic material, combustion products, etc.). Condensation of vapor, radon, and thoron upon nuclei is described mathematically. Radioactive aerosols produced by cosmic radiation and by nuclear explosions in the lower atmosphere are not transported downwards at any significant speed. The particles are too small to have appreciable terminal velocity and vertical eddy diffusion in the stratosphere is slight. Removal of lower atmospheric radioactivity is partly by washout in rain and partly by direct "dry" deposition. The behavior of radio-iodine and methyl radio-iodine is discussed. The transport of radioactive aerosols to surfaces, important in filters and scrubbers, is also described mathematically; work in this area is reviewed and applied to problems such as the travel and deposition of spores and pollen.##

08758

Hess, R. E.

EFFECTIVENESS STUDY OF REFLECTIVE CLOUDS. Battelle Memorial Inst., Columbus, Ohio,Reacte Area Conflict Information Center, Contract SD-171, RACIC-TR-57, 18p., Feb. 28, 1967, 6 refs.
CFSTI, DDC: AD 650509

Quantitative data from which first-order estimates of the reflective power of chemically induced clouds could be made were provided The means of making first-order estimates related to weapons effects in general was also provided. A computer program was developed. Input data consist of the spectral distribution of the incident energy, the composition of the scatter, and the size distribution of the scatterer. The program computes the volumetric scattering intensity. Preliminary results obtained with the program indicate a very prominent degree of lateral scattering ##

08805

Knauer, A.

ABOUT THE RELATIONSHIP BETWEEN AIR POLLUTION AND SELECTED METEOROLOGICAL MEASUREMENTS - PRESENTED AS AN EXAMPLE MEASUREMENT SERIES OF SO2 AND NO2 OVER A PERIOD OF SEVERAL YEARS. ((Ueber Beziehungen zwischen Luftverunreinigung and ausgewahlten meteorologischen Messgrossen - dargestellt am Beispiel mehrjahriger SO2 und NO2-Messreihen.)) Text in German. Z. Ges. Hyg. Ihre Grenzebiete (Berlin), 13(7):473-476, July 1967.

A sulfur dioxide pollution measurement series of 40 months duration (about 7,500 individual measurements) and nitrogen dioxide measuring series of 31 months duration (about 6,000 individual measurements) were evaluated. The measurements were taken hourly between March 1963 and June 1966 (NO2 from December 1963) during all workdays from 8:00 a.m. to 4:00 p.m. at the Hygiene-Institute of the Humboldt University. The minimum and maximum of the monthly mean values for SO2 and NO2 occur at approximately the same times and are repeated in a yearly rhythm. The maximum of pollution invariably coincides with the minimum of air temperature and vice versa. The air-hygienic exposure conditions and the frequency with which the hygienically admissible limit is exceeded are described. During heating periods SO2 rates exceed the limit by an average of 17.2%, while during nonheating periods the average exceeding value is 1.7%. NO2 emissions never exceeded the hygienically admissible limit value. The proportion of the monthly mean value for NO2 and SO2 also changed periodically. Low values of horizontal wind velocity and low air temperatures increased the SO2 emission values. The least favorable air hygienic hygienic conditions were recorded during heating periods, when the wind velocity was below 3 Bft. (8-12 mph) and the air temperature below or at + or - 0 deg C. The SO2 emissions exceeded the admissible limit by an average of 45% under these conditions. (Author's abstract, modified)##

08834

Eldridge, Ralph G.

A COMPARISON OF COMPUTED AND EXPERIMENTAL SPECTRAL TRANSMISSIONS THROUGH HAZE. Appl. Opt., 6(5):929-933, May 1967. 13 refs.

Spectral transmissions through haze are computed using meteorological observations to specify aerosol scattering and water vapor, carbon dioxide, and ozone absorption. The computed spectral transmissions are compared with the appropriate experimental transmissions to evaluate the degree to which a natural spectral transmission can be simulated by a computed spectral transmission. The comparison indicates that the dominant atmospheric attenuating parameter is the absolute distribution of aerosols. (Author's abstract)##

08868

Kattawar, George W. and Gilbert N. Plass

INFLUENCE OF PARTICLE SIZE DISTRIBUTION ON REFLECTED AND TRANSMITTED LIGHT FROM CLOUDS. Southwest Center for Advanced Studies, Dallas, Tex., Contract AF19(628)-5039, Proj. 4076, Task 407604, AFCRI-67-4028, SR-5, 40p., Aug. 24, 1967.
CFSTI, DDC: AD 660604

The light reflected and transmitted from clouds with various drop size distributions is calculated by a Monte Carlo technique. Six different models are used for the drop size distribution: isotropic; Rayleigh; haze continental; maritime; cumulus; nimbostratus. The scattering function for each model is calculated from the Mie theory. In general the reflected and transmitted radiance for the isotropic and Rayleigh models tend to be similar to those for the various haze and cloud models. The reflected radiance is less for the haze and cloud models than for the isotropic and Rayleigh models, except for an angle of incidence near the horizon when it is larger around the incident beam direction. The transmitted radiance is always much larger for the haze and cloud models near the incident direction; at distant angles it is less for small and moderate optical thicknesses and greater for large optical thicknesses (all comparisons to isotropic and Rayleigh models). The downward flux, cloud albedo, and mean optical path are discussed. The angular spread of the beam as a function of optical thickness is shown for the nimbostratus model.##

09113

Mee, Thomas R.

DEVELOPMENT OF THE THEORETICAL AND TECHNOLOGICAL PREREQUISITES TO FIELD INVESTIGATION OF PARTICULATE AGENT BEHAVIOR. VOLUME III. TEST TECHNOLOGY DEVELOPMENT. (FINAL REPORT). Travelers Research Center, Inc., Hartford, Conn., Contract DA-18-035-AMC-399(A), Proj. 1C025001A128, TRC-4, 98p., May 1967. 3 refs.
CFSTI: AD 817967

The development of test technology is reported. The basic system considered was one that would produce, disperse, and sample monodisperse particles. A number of separate runs were conducted for each different test series using monodisperse particles of a selected size for each run. A device was conceived for continuous particle sampling with temporal resolution, and an associated automatic data-reduction device. An experimental model of the sampling device, the Continuous Filament Rotary Impactor, was built and experiments were conducted with variations of it. The device incorporates a continuous sampling technique for collecting both liquid and solid airborne particles and for giving time resolution to the collected sample. The sampler consists of a

rotating arm that continuously exposes a fresh surface of specially treated sampling filament to the airstream. Several methods of permanently fixing the sampled particles to the sampling filament were investigated. The most promising method consists of encapsulating the particles in a substrate contained on the filament, resulting in a permanent record of particles collected as a function of time. As an auxiliary to the sampler, an experimental model of an automatic data-reduction device was built. The data-reduction device can process a sampling filament, typically about 1000 ft long, in about 10 minutes, and the device will count all fluorescent tracer particles contained on the filament.##

09171

Wallington, C. E.

AN ATMOSPHERIC DIFFUSION SLIDE-RULE. Meteorological Office, London, England, Met. O.774, 32p., 1966. 5 refs. (Scientific Paper 24.)

A slide-rule that can be used to calculate concentrations and dosages in clouds of aerosols being transported and diffused by atmospheric wind and turbulence is described. The slide-rule includes scales for incorporating into the calculations several methods of assessing depths and widths of diffusing clouds, but the relative merits of the methods are not discussed in detail; the main purpose of the paper is to present the slide-rule as a calculating aid. The slide-rule is not intended for laymen to the subject of atmospheric diffusion; it is more for those who have at least a little understanding of the theoretical background. For such user the slide-rule provides a means of predicting or assessing experimental diffusion observations; it facilitates comparison of various methods of diffusion calculations and it enables a user to compile tables or graphs suitable for use by laymen. (Author's summary, modified)

09283

Stern, Arthur C.

TESTIMONY. Preprint, Public Health Service, Washington, D. C., National Center for Air Pollution Control, 19p., 1967. 1 ref. (Presented at the Air and Water Pollution Subcommittee, Committee on Public Works, United States Senate, Washington, D. C., Feb. 8, 1967.)

A discussion of the problems involved in using meteorology as a tool in the control of air pollution is presented by the National center for Air Pollution Control. Specifically discussed are: the concept and definition of air sheds; the effect of man produced pollution in modifying the weather; the prediction of atmospheric conditions conducive to pollution build-up; and the prediction of pollution concentration levels and system for using

such prediction as an air quality management tool. The progress and future plans regarding these problems are described. Included in future plans are; the development of small scale mathematical models for pollution concentration studies and of a comprehensive weather data network. The DHEW program in meteorology is discussed with mention of its program with ESSA. A study of ice nuclei from auto exhaust and iodine vapor is attached.##

09306

Drummond, A. J. and Angstrom A. K.

SOLAR RADIATION MEASUREMENTS ON MAUNA LOA (HAWAII) AND THEIR BEARING ON ATMOSPHERIC TRANSMISSION. Solar Energy, 11(3):1-9, 1967. 10 refs.

The essential results are presented of an analysis of solar radiation measurements carried out during the period 1 March 1961 to 30 June 1962, at the Mauna Loa High-Altitude Observatory. Four precision filter pyranometers (the outputs of which were recorded continuously on strip-chart millivolt potentiometers) and a normal incidence pyrheliometer (on an automatic equatorial mount) were read at certain times during the day, corresponding to dixed solar elevations. The basic records were of total integral wavelength sun and sky radiation and its spectral components and also of the integral wavelength direct solar radiation. The maximum intensity of the direct solar radiation closely approaches the values previously measured at other very high-level stations such as Mt. Whitney, Pico de Teyde (Tenerife) and Mt. Everest, for conditions of extremely pure air, viz about 1.67 cal./sq. cm. min. The spectral composition of the sun and sky radiation for cloudless skies appears to be remarkably constant at all solar elevations. Infrared radiation (i.e. lambda greater than about 700 mu) constitutes 50.5 plus or minus 1 percent of the total flux, which means that the energy of shorter wavelengths has a similar constant proportionality (49.5 plus or minus 1 percent). With regard to the influence of clouds, high and thin sheets like cirrostratus do not introduce significant changes in the relative composition of the total radiation. On the other hand, the presence of low cloud masses like cumulus seems to cause a decrease in the relative value of the longer wavelength radiation, to approximately 45 percent, corresponding to an increase of about 3 to 5 percent in the shorter wavelengths. The mean value derived for the Angstrom atmospheric turbidity coefficient beta is low as 0.015. The atmospheric water-vapor absorption is found to be 0.13 cal./sq. cm. min., with a slight annual variation indicating a maximum in the summer months and a minimum in winter.##

09310

Kalika, Peter W.

THE GROWING PROBLEM. Mach. Des., 39(17):19-21, July 20, 1967.

The facts, figures, and concern about the national problem of air pollution are covered. Past air pollution episodes, sources and types of pollutants released in the atmosphere, and the mechanisms and characteristics of temperature inversions are reviewed.

09311

Lowry, William P, and Richard W. Boubel

METEOROLOGICAL CONCEPTS IN AIR SANITATION. Oregon State Univ., Corvallis, 59p., 1967.

This book is based upon notes developed for a series of meteorological lectures. Any willing student of physical science or engineering can quickly grasp the concepts presented after the sophomore year. Chapters are included on: the pseudoadiabatic chart: theory; the pseudoadiabatic chart: application; atmospheric radiation; wind and convection transfer; the energy budget concept; atmospheric motion; air pollution meteorology; and the climate of cities.

09426

Bracewell, J. M. and D. Gall

THE CATALYTIC OXIDATION OF SULPHUR DIOXIDE IN SOLUTION AT CONCENTRATIONS OCCURRING IN FOG DROPLETS. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs, Organisation for Economic Co-operation and Development, Paris, Directorate for Scientific Affairs, Paper 2, Dec. 1967, p. 17-26. 14 refs.

A preliminary study of the oxidation of sulphur dioxide in aqueous solution was made by using aqueous solutions of known sulphur dioxide concentration. Two hundred ml was then taken in a flask in a bath at 25 degrees C and purified air was passed through it to maintain a constant (saturated) oxygen concentration. Catalyst was added in solution and the conductivity measured with bright platinum electrodes was recorded against elapsed time. At 25 degrees C the uncatalyzed oxidation of sulphur dioxide at a concentration of .000036 moles/liter was found negligible over a period of 16 hours. The effect of sulphur dioxide concentration in the range 1 to .000034 moles/liter was therefore explored in the presence of manganous sulphate at a constant concentration of .00009 moles/liter. Plots are given for the experimental data obtained with sulphur dioxide concentrations of 1.95 and .0000243

moles/liter. The calculated value of conductance which would have been reached if the reaction had gone to completion is indicated.##

09427

Persson, Goran

A STUDY OF THE RATIO SULPHATE: TOTAL SULPHUR AND SULPHURIC ACID: TOTAL SULPHUR IN GOTHENBURG DURING DIFFERENT METEOROLOGICAL CONDITIONS. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs, Paris, Organisation for Economic Co-operation and development, Paris, Directorate for Scientific Affairs, Paper 3, Dec. 1967, p. 27-30.

The oxidation of sulphur dioxide in the atmosphere was investigated to determine if it gives an important contribution to the amounts of sulphates and sulphuric acid in the Gothenburg air. Two stations were selected for the study. Station A represents the central area of the city and station B a residential area, not far away from the center. The only difference in pollution between the two stations is that at station A the traffic is a great source of suspended matter and smoke. Daily means of sulphur dioxide, sulphuric acid, sulphate, suspended matter, smoke, humidity and wind speed were measured during November 1963 - April 1964. Sulphur dioxide was measured by the hydrogen peroxide method and the pararosaniline method. The two procedures gave identical results. Sulphates and sulphuric acid were sampled with a membrane filter. The filter was then washed with distilled water and the sulphate determined by colorimetric titration using Thoron as indicator. Suspended matter was sampled by High Volume Samplers on glass fiber filters. Smoke was determined by the standardized reflectometric procedure. The concentrations of sulphur dioxide, suspended matter and smoke are given in a table. The percentage of total sulphur present as sulphate and sulphuric acid is given. Sulphates and sulphuric acid in the Gothenburg air are emitted mainly from oil heated furnaces, and the portion formed in the atmosphere is apparently small.##

09429

Cummins, E. T.

SOME STUDIES ON THE SYNTHESIS OF PARTICULATE ACID SULPHATE FROM THE PRODUCTS OF COMBUSTION OF FUELS AND MEASUREMENT OF THE ACID IN POLLUTED ATMOSPHERES. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organisation for Economic Co-operation and Development, Paris, Directorate for Scientific Affairs, Paper 5, Dec. 1967, p. 39-46. 10 refs.

Coal was burnt on an experimental open fire, and the effluent from its chimney blown rapidly into polythene bags. Particulate acid was detected with a cascade impactor loaded with gelatin-coated slides impregnated with thymolblue. Measurements using standard techniques showed that for initial concentrations of sulphur dioxide in the range 50 to 100 p.p.m. and smoke 10 to 15 mg/cu m the particulate acid concentration rose from a range of 2.5 to 3.5 mg/cu m to between 16 and 85 mg/cu m in thirty minutes. When the coal was burning well it was found that large amounts of the sulphur dioxide were oxidised to particulate acid in less than one minute, and in periods of five minutes very large amounts of acid were detected. When the fire was producing black smoke, less acid was manufactured in the bags. No acid was made in the bags when all the particulate matter from any stage of burning was removed by filtration. At times of high air pollution accompanied by fog, many of the particles that can be collected on thymolblue slides used in a cascade impactor show an acid reaction indicating that they are pH 2 or more strongly acid. An analysis of the concentrations of pollutants during periods of high pollution over the past ten years showed for a given type of pollution that there was a good correlation between hourly concentration of particulate acid in excess of 50 microgram/cu m air and the product of sulphur dioxide and particulate matter concentrations. Data for several periods of high pollution during the past ten years provide a relationship between particulate acid sulphate for concentrations in excess of 50 microgram/cu m and sulphur dioxide. There is a correlation coefficient of 0.90 between particulate acid concentrations and the square of the sulphur dioxide.##

09430

Liberti, Arnaldo and Giuseppe Devitofrancesco

EVALUATION OF SULPHUR COMPOUNDS IN ATMOSPHERIC DUST. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organisation for Economic Co-operation and Development, Paris Directorate for Scientific Affairs, Paper 6, Dec. 1967, p. 47-51.

Extensive research on the physical constitution and chemical composition of atmospheric dust and physico-chemical transformation of sulphur compounds is discussed. Surface area was determined for dust collected in various Italian cities by using a gas adsorption technique. The surface area was found to be about 6.2 sq. m./g. Volatile compounds were analysed by infrared spectroscopy. CO_2, CO, CH_4, NH_3, N_2O, nitro-compounds, and ethylene were detected. Sulphur content of atmospheric dust was determined by combustion and the sulphate by extraction with dilute mineral acid. No detectable amount of sulphur dioxide and of free acidity was found.##

09431

Junge, Chr. and G. Scheich

MEASUREMENTS OF THE HYDROGEN ION CONCENTRATION OF ATMOSPHERIC AEROSOLS. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organisation for Economic Co-operation and Development, Paris, Directorate for Scientific Affairs, Paper 7, Dec. 1967, p. 53-61. 2 refs.

Measurements were made of the total soluble matter, free hydrogen ions, sulfate, ammonia, chloride, and nitrate content of various size particulates. The aerosols were collected in one or two stage impactors at a flow rate of about 2 cu m/hour daily between 8 and 12 o'clock in the morning, except on Sundays and holidays. The samples were washed off with 3 ml of double distilled CO2 free water, corresponding to natural rainout of clouds with a liquid water content of 0.5 ml H2O/cu m air. The following analytical methods were used: (1) conductivity measurements; (2) pH measurements; (3) nepholometric determinations; (4) Nessler's reagent; (5) Bergmann and Sanik's method; (6) K-Na-tartrate method; and (7) West and Gaeke's method. Large particles contain considerably higher fractions of soluble constituents than the giant particles. Hydrogen ion (H+) concentrations vary by two orders of magnitude. High values of H+ in Mainz and low values in Wolfsheim occur during fog and/or calm winds. High H+ concentrations in Mainz as well as in Wolfsheim occur if cold continental air masses arrive with north-easterly winds and with temperature inversions below 1.5 km. A comparison of the mean ion concentrations for different places is given. Scatter diagrams are given for the concentrations in Mainz and Wolfsheim of total soluble matter, sulfate and SO2 against that of the hydrogen ion.##

09433

OKITA, TOSHIICHI

MEASUREMENTS OF THE CONCENTRATIONS OF SULPHUR COMPOUNDS IN THE ATMOSPHERE AND LABORATORY EXPERIMENTS ON THE OXIDATION OF SULPHUR DIOXIDE AT THE SURFACE OF PARTICLES. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organisation for Economic Co-operation and Development, Paris, Directorate for Scientific Affairs, Paper 9, Dec. 1967, p. 75-86.

Measurements of the content of sulfate and other inorganic components in cloud and fog water at Asahikawa, Shiobara, Mt. Tsukuba, and Mt. Norikura show that at Asahikawa the sulfate was mainly present as calcium sulfate. At Mt. Norikura, ammonium sulfate and sulfuric acid were main constituents of cloud water. At lower levels of the atmosphere the concentration of sulfuric acid decreased and sulfate was associated with ammonium and other cations. The SO2 concentrations in the country and mountain air ranged from 1.4 to 6.0 micrograms/cu m. A membrane filter method for measuring the concentration of atmospheric H2S and sampling of H2S at Yellowstone was developed. The

atmospheric concentration of H2S was usually below 1 ppb. Measurement of sulfate and other inorganic components in atmospheric particulates by a high volume two stage impactor indicated that at Tokyo the weight ratios of sulfate to ammonium were 1.1 and 2.3 for giant and large particles, respectively. The ratio of the SO4 to SO2 concentration ranged from 1.9 to 69. The maximum sulfate concentration was 63 micrograms/cu m. Measurements of acid particles in the atmosphere and laboratory experiments of the oxidation of SO2 on the surface of particles by the Thymolblue indicator method frequently detected acid particles in Tokyo and Osaka. Manganese compounds, active carbon and some materials in coal soot were effective in producing sulfuric acid mist. Iron and calcium carbonate apparently reacted with SO2 to form sulfate in unsaturated air. Daily averages of dust and sulfate loading for a three-month period at three stations are summarized.##

09438

Petrenchuk, O. P. and V. M. Drozdova

ON THE CHEMICAL COMPOSITION OF CLOUD WATER. Tellus 18(2):280-286, 1966. 20 refs.

The chemical composition of the cloud water collected in the different regions of the USSR is considered. On the basis of their analysis and generalization the main characteristics of chemical content have been obtained. The total ion amount of cloud water is slightly different from that of atmosphere precipitation and there is a remarkable difference in their chemical composition. Subinversion clouds are peculiar filters capturing different contaminations from the atmosphere and stimulating its refinement to some extent. A great influence of industrial pollution on the chemical composition of cloud water is noted.##

09439

Mrose, H.

MEASUREMENTS OF PH, AND CHEMICAL ANALYSES OF RAIN-, SNOW-, AND FOG-WATER. Tellus, 18(2):266-270, 1966. 7 refs.

Since 1957 more than 200 samples of rain water have been analysed at the Meteorological Observatory of Dresden-Wahnsdorf (51,1 degrees N, 13,7 degrees E). At four mountain summit stations and one coastal station fog water was sampled and analysed. The yearly mean of the pH has remained constant since 1958, while in western Europe Jessel found a decrease in the pH. There are no differences in the pH between summer and winter and between shower and rain. There are no differences in the concentration of chemical traces between shower and rain, the seasonal difference is unimportant. The concentration of traces including the artifical beta radioactivity in fog water is larger by one order of magnitude. It is possible to estimate the trace

content of one cubic meter of air from the trace concentration of the fog water and the water content of the fog, if the fog persists for a long time. (Author's abstract)##

09465

Martell, E. A.

THE SIZE DISTRIBUTION AND INTERACTION OF RADIOACTIVE AND NATURAL AEROSOLS IN THE STRATOSPHERE. Tellus, 18(2):486-498, 1966. 54 refs.

Artificial radioactivity which persists in the stratosphere on a time scale of years is shown to be associated with particles below 0.02 micron radius above 27 km and with particles very nearly 0.1 micron radius between 21 km and the tropopause. Assuming the artificial radioactivity to be associated with natural aerosols at each level, the radioactive particle size data provide insight on the size distribution of micrometeorites and other particulates in the upper stratosphere and their interaciton with sulfate particles in the lower stratosphere. The decrease in specific radioactivity with increased sulfate particle radius near 20 km suggests that the photochemical oxidation of SO2 may not be the important mechanism for large particle formation at this level. Chemical factors and residence time considerations support the view that Aitken nuclei in the upper troposphere are sulfate particles of sufficient size and population to account for the production of large sulfate particles near and above the tropopause by Aitken nuclei coagulation. Approximate estimation of the total sulfate mixing ratio with altitude above 5 km indicates a broad maximum in the upper troposphere. Photochemical and radiochemical evidence for the rapid oxidation of SO2 in the stratosphere reinforces these views. It is tentatively concluded that Aitken particles in the troposphere account for most of the sulfate in the atmosphere and that there is no stratospheric sulfate layer but only a stratospheric "large particle" layer. (Author's abstract)##

09466

Plass, Gilbert N. and George W. Kattawar

CALCULATIONS OF REFLECTED AND TRANSMITTED RADIANCE FOR EARTH'S ATMOSPHERE. Southwest Center for Advanced Studies, Dallas, Tex., Contract AF19(628)-5039, ¢PROJ. 4076, ¢TASK 407604, ¬SR-1, 27 p., Sept. 13, 1967. 11 refs.
CFSTI, DDC:AD 661267

The reflected and transmitted radiance of the earth s atmosphere is calculated by Monte Carlo techniwues. The exact scattering function for the aerosols is used as calculated from the Mie theory. The aerosol vs. height distributions proposed by Elterman and by Kondratiev et al are compared. The Rayleigh and aerosol scattering events are included in the calculation, as well as the ozone absorption, where appropriate. Results are given at wavelengths of

0.27, 0.3, 0.4, 0.7, and 1.67 micron. The mean optical paths of the reflected and transmitted photons, the flux at the lower boundary, and the planetary albedo are tabulated. (Authors abstract)

09549

Leone, Ida A., Eileen Brennan, and Robert H. Daines

THE RELATIONSHIP OF WIND PARAMETERS IN DETERMINING OXIDANT CONCENTRATIONS IN TWO NEW JERSEY COMMUNITIES. Atmospheric Environ., Vol. 2, p. 25-33, 1968. 20 refs.

A two-year study of the relationship of wind speed and direction to total oxidant (including ozone) concentration and phytotoxicity was made of two New Jersey communities, Carlstadt and New Brunswick, where air pollution damage to vegetation has frequently been observed. Results obtained during a 4-hr period from 11 AM to 3 PM indicated a negative correlation between wind speed and significant oxidant concentration during all months of the year. Winds originating from the directions of heavily populated and industrialized areas with respect to each community were associated with oxidant concentrations which were significantly higher than those occurring when winds proceeded from suburban or residential areas. While wind speed was not demonstrated to be related to the build-up of the very low concentrations required to injure extremely sensitive tobacco plants (0.035 ppm), higher concentrations (above 0.060 ppm) correlated very well with changes in wind speed. Whereas 46 percent of all the oxidant concentrations in excess of 0.035 ppm occurred when the wind was less than 4 mph in velocity, 90 percent of the concentrations above 0.060 ppm occurred when wind speed was at this low level. As with earlier results for sulfur dioxide concentrations, the majority of potentially phytotoxic oxidant concentrations in Carlstadt or those which could be injurious to sensitive crops if grown in the area were associated with the winds originating from the NE and SW. Concentrations at this level rarely occurred when the wind was from due N.

09567

Faith, W. D.

THE PHOTOCHEMISTRY OF SOLVENT VAPORS. Air Eng., 10(2):16-17, Feb. 1968.

The development of photochemical smog in the Los Angeles Basin and the photochemical reaction taking place in smog formation are reviewed. In the Los Angeles Basin, San Francisco Bay Area, Denver, St. Louis, Philadelphia, Cincinnati, Washington D.C., and Chicago, the annual frequency of smog days is 200, 50, 14, 7, 6, 5, 4, and none respectively. To produce photochemical smog the following are needed: (1) reactive organics; (2) NOx well mixed with the organics; (3) a stagnant atmosphere; and (4) intense sunlight. The elimination of any one of these four, eliminates the photochemical

smog problem. The chief source of atmospheric organics is the automobile. Since most communities are well saturated with motor vehicle exhaust, the main difference between Los Angeles and other cities must be meteorology. Los Angeles needs more control than the San Francisco Bay area which in turn needs more than Eastern cities. It follows that Rule 66 for organic solvent emission control in Los Angeles is more strict than Regulation 3 in San Francisco. Local situations must be evaluated before any community contemplates organic solvent control for it may produce little public good.

09601

Bourquin, K. R. and F. H. Shigemoto

INVESTIGATION OF AIR-FLOW VELOCITY BY LASER BACKSCATTER. National Aeronautics and Space Administration, Moffett Field, Calif., Ames Research Center, 21p., April 1968. 7 refs.
CFSTI: NASA-TN-D-4453

An investigation of laser light backscatter properties from an atmosphere emphasized the effect of frequency shift. The detection scheme described is based on this effect and proved successful in the laboratory determination of flow velocity of a contaminated atmosphere. The results agree well with measurements taken with a hot wire anemometer. This investigation used a continuous wave laser radiating in the visible region. The velocity of an air stream containing a small concentration of contaminants was measured. Using this technique to detect clear air turbulence would require that Mie scattering predominate in the turbulent region. This technique does not presently appear practical for airborne detection of clear air turbulence considering the available laser transmitters and detectors, and the uncertain knowledge of the contaminating particle content in a turbulent region.**

10018

Fensterstock, Jack C. and Robert K. Pankhauser

THANKSGIVING 1966 AIR POLLUTION EPISODE IN THE EASTERN UNITED STATES. Public Health Serivce, Durham, N.C., National Center for Air Pollution Control, Publication N/. AP-45, 45p, July 1968. 12 refs.

The Thanksgiving 1966 Air Pollution Episode in the Eastern United States is documented in terms of daily meteorology and ambient air quality. Analysis of the available air quality data indicates that the Air Pollution Potential Forecast Program (APFP) of the Public Health Service and Weather Bureau did forecast the stagnation. Meteorological data for selected cities were based on the diurnal average temperature, cloud cover, afternoon mixing depths, average

wind speed through mixing depth, ventilation, resultant wind direction and the average surface wind speed. Air quality measurements on the gaseous pollutants sulfur dioxide, oxides of nitrogen, hydrocarbon and carbon monoxide were made daily. Suspende and settling particulate of solids and liquids were also measured diurnally. The high level of air pollution in the eastern U. S. during the period Nov. 24 through 30, 1966, created adverse health effects. Researchers in New York City found an increase in the death rate of approximately 24 deaths per day during the period.

10182

Junge, Christian

THE MODIFICATION OF AEROSOL SIZE DISTRIBUTION IN THE ATMOSPHERE. (FINAL TECHNICAL REPORT JULY 1, 1963 THRU JUNE 30, 1964.)
Gutenberg - Universitaet, Mainz, Germany, Meteorologisch Meteorologisch Geophysikalisches Institut, Contract DA 91-591-EVC 2979, ((90)) p., July 1964. 17 refs.
DDC: AD 445873

A comprehensive quantitative study is made of the various processes in the atmosphere which are known to have an effect on the size distribution of natural aerosols. One of the most important processes is the coagulation of aerosol particles by Brownian motion which is always in operation inside and outside of coulds. Smoluchowski s expression for this process is evaluated for various model distributions of atmospheric aerosols. The results indicate that particles smaller than 10-6 cm radius disappear rapidly out that the concentration of particles larger than 10-5 cm is not much influenced. Estimates show that necessary refinements of Smoluchowski's expression do not effect these results very much. The processes of aerosol modification become more complex in the presence of water clouds. Most particles go through several cycles of water condensation and reevaporation before they are removed by precipitation. In this study a first attempt is made of a quantitative formulation of all those processes which modify the aerosol distribution in the course of these condensation cycles. Important parameters which enter these calculations are the fraction of tropospheric air occupied by clouds, the number of condensation cycles, the life time of clouds and the concentration of cloud droplets. The calculations are performed for various combinations of these parameters. The results show that continental aerosol distributions "age" by decreasing in concentration and by assuming a more uniform size distribution with peak concentrations somewhat smaller than or around 10-5 cm radius. Observations seem to indicate that tropospheric "background" aerosols have similar characteristic. The investigations are continued. (Author s abstract)

10227

Petrenchuk, O. P., V. M. Drozdova, and M. A. Belyashova

CHEMICAL COMPOSITION OF CLOUD WATER AT DIFFERENT MICROSTRUCTURES OF THE CLOUDS. (Khmicheskii sostav oblachnoi vody pri razlichnoi mikrostrukture oblakov.) Text in Russian. Tr. Gl. Geofiz. Observ. (Leningrad), No. 207:82-86, 1968. 8 refs.

Samples were taken from different types of clouds (stratus, stratocumulus, nimbostratus) using an airplane and the water was analyzed for SO4, Cl, NO3, HCO, NH4, Na, K, Mg, and Ca. Stratus and stratocumulus clouds contained more mineral substances than nimbostratus. Generally these findings agree with previous conclusions that the mineral content in clouds is indirectly proportional to the droplet size. Experiments were also made by taking samples in the same type of cloud but at different altitudes ranging from 600 to 1,000 m. This experiment did not show a relationship between the electric conductivity (mineral content) and the altitude of sample withdrawal. A dependence of the mineral content on microphysical structure (type of cloud) is definitely established.

10228

Rastorgueva, G. P. and I. I. Solomatina

HEAT BALANCE OF THE EFFECTIVE SOIL SURFACE IN THE REGION OF THE MOLDAVA THERMAL POWER PLANT. ((Teplovoi balans deyatel'noi poverkhnosti v raione moldavskoi GRES.)) Text in Russian. Tr. Gl. Geofiz. Observ. (Leningrad), No. 207:179-187, 1968. 3 refs.

Comprehensive meteorological and soil measurements were made in the Moldavia region to obtain data necessary for calculating a heat balance in this region. The daily variations of radiation flux, convection into the soil, turbulent convection and heat loss due to evaporation are plotted. The results show that in September 51% of the radiative heat flux incident on the soil is used for heating of air and 44% for evaporation.##

10285

Galtally, Lan

SOME MEASUREMENTS OF OZONE VARIATION AND DESTRUCTION IN THE ATMOSPHERE SURFACE LAYER. Nature, 218(5140):456-457, May 4, 1968. 2 refs.

A preliminary investigation into the variation and destruction of ozone in the lower atmospheric layer is reported. The measurements were made at Hay, New South Wales, Australia during an expedition in Aug. 1967. The measurements of O3 were made with a Mast-Brewer ozone-sonde suspended from a tether balloon. The measured destruction rates of O3 at the earth's

surface are in substantial agreement with Regener, but considerably larger than estimates of average destruction rates obtained from O3 considerations summarized by Junge.##

10436

Leipper, Dale F.

THE SHARP SMOG BANK AND CALIFORNIA FOG DEVELOPMENT. Bull. Am. Meteorol. Soc., 49(4):350-358, April 1968. 4 refs.

Meteorological conditions associated with the observance of a sharp smog bank near Riverside, Calif., are compared with those previously shown to be related to the development of winter fogs in California. The conditions are similar. Thus, it is proposed that three simple indices found useful in the prediction of west coast fo be used also to predict situations favorable to the shallow, sharp banked smogs which have been observed. The indices measure the influence of the sea surface temperature field upon air warmed in downslope flow associated with easterly winds in the area. (Author' abstract)

10504

Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control

IRONTON, OHIO - ASHLAND, KENTUCKY - HUNTINGTON, WEST VIRGINIA AIR POLLUTION ABATEMENT ACTIVITY. PRE-CONFERENCE INVESTIGATIONS. (TECHNICAL REPORT.) 85p., May 1968 8 refs.

An extensive area survey of air pollution was conducted in the Ironton, Ohio; Ashland, Kentucky; Huntington, West Virginia region for the period of September 1965 to August 1967. The following topics are discussed: topography; climate; materials deterioration; industrial, municipal, and private emission sources; geographic distribution of pollutants; and measurement methods and locations. The pollutants of interest were particulates, NOx, SOx, and H2S. An emission inventory is included, along with discussions of some of th major pollution sources.

10605

Environmental Science Services Administration, Silver Spring, Md., Air Resources Labs.

METEOROLOGICAL FUNDAMENTALS FOR ATMOSPHERIC TRANSPORT AND DIFFUSION STUDIES. In: Meteorology and Atomic Energy 1968, David H. Slade (ed.) p. 13-63, July 1968. 5 Refs.
CFSTI: TID 24190

The variety of subdisciplines of meteorology of which have some bearing on the understanding of transport and diffusion processes in the atmosphere are discussed for non-meteorologists. Concepts and terminology used in atmospheric transport and diffusion studies are presented. Basic physical atmospheric processes and the weather systems that result from these processes, climatology and conventional weather data and the fundamental concepts related to transport and diffusion studies are discussed.##

10682

Hamilton, Harry L., Jr., James J. B. Worth and Luman A. Ripperton

AN ATMOSPHERIC PHYSICS AND CHEMISTRY STUDY ON PIKES PEAK IN SUPPORT OF PULMONARY EDEMA RESEARCH. Research Triangle Inst., Durham, N. C., Contract DA-HC19-68-C-00298, 54., May 1968. 10 refs.
CFSTI, DDC: AD 680989

Measurements of atmospheric trace gases on the summit of Pikes Peak (14,110 ft) from late July through mid-October 1967 were made in support of pulmonary edema research. Suporting meteorological data were also cclleсted. Local intermittent contamination by combustion products afforded an opportunity to examine conditions corresponding to those which might be experienced by troops in encampments. Concentrations of ozone (O3), in uncontaminated air showed a maximum at night and a minimum during the daytime. The daytime minimum is attributed to mixing of the air from the altitude of the peak with ozone-depleted air from near ground level in adjacent valleys and plains. In contaminated air, ozone concentration on the average showed no maximum, and mean values for each hour were considerably lower than in uncontaminated air. This reduction results from destruction of ozone by NO from combustion products; measured concentrations of NO appear adequate to account for the decrease in ozone. Auxiliary stations for ozone measurement on the mountainside (10,840 ft) and at the base of the mountain (7,780 ft) showed the daytime maximum and nighttime minimum normally experienced in the lowlands. The station at 10,840 ft showed consistently higher ozone concentrations than did the valley station, with daytime values approaching the maximum (nighttime) values recorded on the summit; no explanation can be offered for this anomaly. A trend from high concentrations of ozone in July to lower concentration in October is apparent, conforming with the normal pattern of tropospheric ozone. A dampening of the diurnal wave patter of ozone concentrations is evident as the average concentration decreases. (Authors' abstract)##

10683

Bruce, Rufus James Mason, Kenneth White, and Richard B. Gomez

AN ESTIMATE OF THE ATMOSPHERIC PROPAGATION CHARACTERISTICS OF

1.54 MICRON LASER ENERGY. Army Electronics Command, Fort Monmouth, N. J. Task 1to14501b53a-13, ecom-5185 , ((41)) p., March 1968. 22 refs.
CFSTI, DDC: AD 670934

Potential atmospheric effects on the propagation of electromagnetic radiation at 1.54 micron wavelength are examined. The results of transmission measurements by various investigators, as reported in the literature, coupled with theoretical calculations are applied to estimate the transmission characteristics for erbium ion (Er+++) laser radiation in this region. The output of the Er+++ laser at 1.54 micron is discussed in some detail. Predominant attenuation mechanisms are found to be aerosol absorption and aerosol scattering. Contributions from five investigations of atmospheric transmission in this region are summarized. Nonlinear effects are not considered.##

10724

Selezneva, Ye. S. and V. M. Drozdova

THE NATURAL BACKGROUND OF ATMOSPHERIC CONTAMINATION AND THE COMPOSITION OF PRECIPITATION OVER THE TERRITORY OF THE USSR. In: Modern Problems of Climatology (Collection of Articles) (Sovremennyye Problemy Klimatologii). Translated from Russian. Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., Contract F33657-67-C1455, TT8000039-67, FTD-HT-23-1338-67, p. 316-324, Nov. 29, 1968. 7 refs.
CFSTI, DDC: AD 670893

The basic results of investigation of the chemical composition of atmospheric precipitation over the territory of the USSR are discussed. Data was collected and analyzed from 70-75 stations, 32 of them located in the Asiatic territory of the USSR. The relationship between the composition of precipitation and natural zones is clarified. The contribution of natural sources and industrial effluents to the total background level of atmospheric contamination is estimated.

10737

Jean Bricard, Francois Billard, and Guy Madelaine

FORMATION AND EVOLUTION OF NUCLEI OF CONDENSATION THAT APPEAR IN AIR INITIALLY FREE OF AEROSOLS. J. Geophys. Res., 73(14):4487-4496, July 15, 1968.

The formation of nuclei of condensation in air initially cleansed of aerosol particles by filtration has been investigated. Such formation may be achieved in the dark. The formation process is accelerated by the action of sunlight or by the introduction into the chamber of thoron free from active

deposit. The evolution of these particles in time, as well as their state of charge, has been studied, and an important influence of coagulation of the process has been found. The possible role of such particles as regards the origin and behavior of the properties of natural aerosols must be considered. (Authors' abstract)##

10787T

Fabry, Ch. and H. Buisson

THE ABSORPTION OF RADIATION IN THE LOWER ATMOSPHERE AND THE AMOUNT OF OZONE . ((Sur l'absorption des radiations dans la basse atmosphere et le dosage de l'ozone.)) Translated from French. Compt. Rend. (Paris), 192:457-461, 1931. 4 refs.

Optical density is computed for different wave lengths in order to show that absorption of visible radiation by the atmosphere is produced by an ozone layer of 0.0022 cm./km. air. An increased absorption in the short wave lengths is probably due to the presence of oxygen. The calculated concentration of ozone required to produce the observed absorption (or 4.3 mg/100 cu m air at 15 degrees C.) is of the same order of magnitude as can be obtained by chemical analysis. If the atmosphere contained the same proportion of ozone at all heights, the total density of ozone in the earth's atmosphere would be 0.18 mm..##

10937T

Grafe, K. and C. Schlunk

MEASUREMENT OF GLOBAL RADIATION AS A CONTRIBUTION TO THE AIR POLLUTION PROBLEM. ((Globalstrahlmessungen als Beitrag zu lufthygienischen Problemen.)) Translated from German. Gesundh. Ingr., 86(2):54-60, 1965. 13 refs.

"Global" radiation is the combined radiation impinging on the earth's surface directly from the sun and diffusely from the sky. In global radiation measurements in the Hamburg area considerable differences in radiation were observed between the stations on individual days. On the average the urban and industrial district showed reductions in radiation as compared to the immediate vicinity of Hamburg, the level of which differed between summer and winter and with varying weather conditions. These reductions in global radiation are attributed to urban and industrial air pollution and make possible an indirect check on the pollution of the air. In the interpretation of the statistical data the complicated interaction of air pollutions and meteorological parameters is taken into account. In conclusion attention is called to the economic aspects of the air pollution situation.##

10980

J. E. Lovill, A. Miller

THE VERTICAL DISTRIBUTION OF OZONE OVER THE SAN FRANCISCO BAY AREA. J. Geophys. Res. 73(16):5073-5079, Aug. 15, 1968.

Observations of the vertical distribution of ozone were made during February 1967 on the San Francisco Bay area with the Carbon-iodine (Komhyr) ozonesonde. Horizontal and vertical velocity components were obtained by simultaneous tracking with an M33 radar. In the lower troposphere, two peaks of ozone were found near 1 and 1.5 km within the west coast subsidence inversion; the lower maximum coincides in position with a wind jet. In the middle and upper troposphere there are significant time variations of ozone, believed to be caused by intrusions of stratospheric air. Undulations in the ozone, temperature, and wind profiles in the stratosphere suggest laminas of air masses. The mean profile of ozone suggests that there are several distinct zones that are related to ozone production and vertical mixing. (Authors' abstract)##

11013

Stephens, Edgar R.

THE MARINE LAYER AND ITS RELATION TO A SMOG EPISODE IN RIVERSIDE, CALIFORNIA. Atmos. Environ., 2(4):393-396, July 1968.

The arrival of a polluted air mass with a sharp boundary was recorded on five chemical recorders. The records of temperature, humidity and wind suggest that this pollution was contained in a layer of marine air which had penetrated about 40 miles inland. (Author's abstract)##

11052

R. C. Weedfall, B. Linsky

A MESOCLIMATOLOGICAL CLASSIFICATION SYSTEM FOR AIR POLLUTION ENGINEERS. Preprint, West Virginia Univ., Morgantown, Dept. of Civil Engineering, 59p., 1968. 21 refs. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-53.)

A method of deriving 3 air pollution potential indexes based on selected climatic data and meso-climate topographic factors has been developed, through not yet adequately field tested, for use by engineers in choosing between alternate factory sites. Three indexes, one for general air pollution, one for photoreactive air pollutants, and one for fog-reactive air

pollutants, the latter two based on the first one plus sunshine and humidity factors respectively, are presented. These indexes vary with locations, not with air pollutants or time. Weaknesses and possible uses of the various stagnation indexes are discussed. (Authors' abstract, modified)##

11221

Went, F. W.

ON THE NATURE OF AITKEN CONDENSATION NUCLEI. Tellus (Uppsala) 18(2):549-556, 1966. 7 refs.

The number of Aitken condensation nuclei in the air is strongly influenced by human activities which increase the natural number manifold through release of combustion products from fires and combustion engines. The natural condensation nuclei near ground level increase during day decrease during night; there is a general decrease with increasing altitude in the atmosphere. These natural Aitken nuclei are produced in light from volatile products released by the vegetation (mainly terpenes) and therefore are organic macromolecules. They disappear again mainly by agglomeration, or near the inversion layer, and are then removed b precipitation. (Author's abstract)##

11230

A. P. Altshuller

COMPOSITION AND REACTIONS OF POLLUTANTS IN COMMUNITY ATMOSPHERES. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ((24))p., 1968. ((33)) refs. (Presented at the Symposium on Urban Climates and Building Climatology, Brussels, Belgium, Oct. 15-25, 1968.)

This paper is concerned with the composition of gaseous and particulate substances in community atmospheres. The available measurements of rates of reaction of various pollutants with oxygen, ozone, atomic oxygen and in nitrogen oxide sensitized photooxidations are tabulated and discussed. The formation, composition and size distribution of atmospheric particulates in the community environment has received considerable investigation recently. The possible mechanisms for sulfate and sulfuric acid formation are considered. The biosphere as a source as well as a sink for pollutants is discussed. The large contribution of biosphere in terms of emissions of methane, terpenes, nitrogen oxides, ammonia and hydrogen sulfide requires much additional investigation. Improvement of understanding of these aspects of atmospheric chemistry, physics and meteorology will necessitate well-designed experiments in both the atmosphere itself and the laboratory. (Author's abstract, modified)##

11274

Lea, Duane A., James L. Sarney, and Cecil A. Knudsen

LASER RADAR RETURNS FROM THE LOWER TROPOSPHERE COMPARED WITH VERTICAL OZONE DISTRIBUTIONS. Preprint, Pacific Missile Range, Point Mugu, Calif., ((12))p., 1966. 8 refs. (Presented at the 12th Conference on Radar Meteorology, American Meteorological Society, Norman, Okla., Oct. 18-20, 1966.)

From May through December 1965, a series of ozone soundings were conducted at Point Mugu using balloon-borne chemiluminescent ozonesondes. Preliminary comparisons of the laser radar returns with vertical ozone distributions in the lower troposphere suggest an inverse relationship, especially in smoggy air advected from the nearby Los Angeles Basin. Enroute to the observing site, the ozone content of the polluted air is presumably depleted in discrete layers by destructive contact with stratified layers of aerosol and cloud from which the laser pulses are backscattered. Differences in observing paths and times, as well as accuracy limitations of the instrumental methods, preclude rigorous analysis of the present data, and resulting conclusions are admittedly speculative. Nevertheless, the results indicate that ozone soundings can provide a useful supplement to conventional radiosone data in interpreting laser returns from polluted air. A systematic program of coordinated laser and ozone measurements should permit improved delineation of striations in atmospheric structure and provide insight into some of the complex physical processes involved in metropolitan pollution regimes.##

11280

Irvine, William M.

DIFFUSE REFLECTION AND TRANSMISSION BY CLOUD AND DUST LAYERS. Preprint, Harvard Coll. Observatory Cambridge, Mass. and Smithsonian Astrophysical Observatory, Cambridge, Mass., ((26))p., Feb. 1966. 35 refs.

The problem of radiative transfer in a medium with a strongly anisotropic phase function is considered. Traditional methods of solution of the transfer equation have not proved practicable. Recent calculations using the Neumann solution, Romanova's method, and the "doubling method" of van de Hulst are described. To facilitate the study of absorption features under conditions of multiple scattering, the probability distribution of photon optical paths is introduced. When appropriately normalized, this distribution satisfies a transfer equation. (Author's abstract)##

11310

Keng, Edward Y. H. and Clyde Orr, Jr.

CHARACTERISTICS OF ATMOSPHERIC HYDROSCOPIC PARTICULATES UNDER CHANGING HUMIDITY CONDITIONS. Preprint, Georgia Inst. of Technology, Atlanta, Engineering Experiment Station, ((15))p., 1968. ((6))refs. (Presented at the 156th ACS National Meeting, Atlantic City, N. J., 1968.)

It has been established on the basis of experimental and theoretical investigations that airborne hydroscopic particles, such as sodium chloride, undergo size changes when the relative humidity increases or decreases. Upon an increase in the environmental relative humidity, the process of moisture accretion proceeds with little change in particle size up to the point where the particle actually dissolves forming a solution droplet. There is then an abrupt increase in size. Further increase of relative humidity causes the droplet size to increase by condensation of moisture. If at this point, the relative humidity is decreased, evaporation of moisture from the droplet occurs and the size decreases. However, recrystallization of the hydroscopic nucleus will not occur immediately at the relative humidity at which it first dissolved. A time lag exists in the process. Vaporous contaminants in the environment may either be condensed on the particulate surface or absorbed by the droplet, giving a homogeneous solution. Nucleation time is altered when compared to the nucleation time for non-contaminated conditions. (Authors' abstract)##

11505

Gajzagc, L.

VARIATICNS OF GICBAL RADIATIONS IN BUDAPEST. Preprint, Central Inst. of Meteorolcgy, Budapest (Hungary), Biometecrology Research Group. ((4))p., 1968. 4 refs. (Presented at the World Meteorological Organization Symposium cn Urban Climates and Building Climatclogy, Brussels, Oct. 15-25, 1968.)

Scme characteristics of the variatics of global radiation in towns are presented, on the basis of data of the 10 winter months. The decrease of radiatien of the town stations and the territorial variations of radiation on days with different wind directions are shown. The mean radiation deficit of the City is in winter 13%, while at the Central Institute it is 18%. The latter data are almost in full conformity with the deviations found by previous measurements. The gradual air pollution taking place during the passage of the air over the town causes in the average a radiation decrease of about 11% on days with NW winds which are as a rule more vivid and turbulent. On days with weaker and almost laminar SE winds, the decrease of the radiation in the city is 22% and the Central Institute 33%. On days with NE, SW and changing wind directions the rate of the variation of radiation is also corresponding to the air pollution to be expected on the basis of the structure of the town and orography. The decrease of the radiation has been investigated also for days without sunshine.##

11516

T. J. Chandler

URBAN CLIMATES: INVENTORY AND PROSPECT. Preprint, University Coll., London, England, (20) p., 1968. 11 refs. (Presented at the World Meteorological Organization Symposium on Urban Climates and Building Climatology, Brussels, Oct. 15-25, 1968.)

Factors determining urban climates are discussed. The most important meteorological element controlling levels of atmospheric pollution is wind. It is the basic parameter of urban climates as a whole. It helps to control pollution concentrations, temperatures, fog frequencies, evaporation rates and humidities, cloud amounts and precipitation. Another important factor in determining urban climate is radiation. Short wave radiation is scattered and absorbed by pollution particles and the surface receipts are highly differentiated by the varied geometry, aspect and albedo of city fabrics.##

11521

R. F. Fuggle, T. R. Oke

INFRA-RED FLUX DIVERGENCE AND THE URBAN HEAT ISLAND. Preprint, McGill Univ., Montreal, (Quebec), (10) p., 1968. 17 refs. (Presented at the World Meteorological Organization Symposium on Urban Climates and Building Climatology, Brussels, Oct. 16, 1968.)

At night, when the urban heat island effect is best developed, there are two energy exchange processes acting to heat the urban atmosphere. Firstly, there is the turbulent diffusion of sensible heat away from the warm city buildings, and secondly, there is the absorption of long-wave radiation emitted by both the city and its pollution cover. The sensitivity of the heat island intensity to wind speed and cloud cover is obviously a reflection of these two processes. A scheme is outlined for studying the effects of long-wave radiation upon the intensity of the heat island in Montreal. In particular, it is stressed that it may be unreasonable, in the case of the polluted urban atmosphere, to assume the usual constancy of the flux with height. A programme for the direct measurement of this infra-red flux divergence is described, including the possibility of its use in urban heat island studies.##

11522

I. Jenkins

INCREASE IN AVERAGES OF SUNSHINE IN CENTRAL LONDON. Preprint, Meteorological Office, London, England, (14) p., 1968. 6 refs.

(Presented at the World Meteorological Organization Symposium on Urban Climates and Building Climatology, Brussels, Oct. 15-25, 1968.)

Over recent years the sunshine in winter months was almost invariably above the long term normals published for Kingsway. For this study, London Weather Centre was used as the city center, Kew Observatory as the suburban site and the Royal Horticultural Society's gardens at Wisley as the rural site. Kew Observatory is 9 miles west-south-west and Wisley 21 miles south-west of Central London. Although London Weather Centre moved to High Holbofn, W.C.1. in Janurary 1965, the new office is within 1/4 mile of the old site at Kingsway so that a comparison with the 30 year normals of sunshine at Kingsway is still valid. The values of duration of sunshine given for the three sites in the Monthy Weather Report were used for this study. The duration of bright sunshine at London Weather Centre since 1958 has increased by about 50% of the long term average (1931 to 1960) during the months November to January and this is probably associated with the decrease in smoke since the Clean Air Act came into force.##

11523

H. E. Landsberg

CLIMATES AND URBAN PLANNING. Preprint, Maryland Univ., College Park, Inst. for Fluid Dynamics and Applied Mathematics, (17)p., 1968. 13 refs. (Presented at the World Meteorological Organization Symposium on Urban Climates and Building Climatology, Brussels, Oct. 15-25, 1968.)

Urbanization brings about several reasonably well-documented micro-and meso-climatic changes. Some of these can be advantageous, such as the heat island effect in cold climates. Others include highly undesirable atmospheric consequences, principally air pollution, which is aggravated by reduction in ventilation and in some areas by insolation. Planning for new towns or for redevelopment of old cities and for their expansion should include climatic facts to minimize adverse effects. Through layout, architecture and engineering measures microclimates may be turned into assets rather than liabilities. Advance climatic studies are particularly necessary in proper siting of airports and industrial installations. Adequate provision for green spaces is always essential. Hydrometeorological studies of flood plains and drainage requirements are also mandatory. Micrometeorological conditions can be mitigated or cleared by judicial arrangement of street orientation, building heights and spacing, hedges, water surfaces, and suitable adaptation to orographic conditions. Regional macroclimatic circumstances, such as snowfall, sunshine duration, wind regime, may dictate different countermeasures in town construction. Knowledge gained from poor adaptations to climate in established settlements can be profitable applied to new urban developments. Several case studies have been made. Noteworthy are those of Kitimat, B.C., and Columbis, Md.

11529

Peterson, James T.

MEASUREMENT OF ATMOSPHERIC AERCSOLS AND INFRARED RADIATION OVER NORTHWEST INDIA AND THEIR RELATIONSHIP. Wisconsin Univ., Madison, Dept. of Meteorology, Contract CNR 1202(07) and NSF GP-5572X, Task NR 387-022, TR-38, ((169))p., Jan. 1968. ((65)) refs.
CFSTI, DDC: AD 673212

Airborne measurements were made of atmospheric aerosols and infrared radiation over northwest India up to 30,000 feet. Simultaneous observations of infrared radiation were also made by balloon-borne net economical radiometers. The instrumentation, which detected both the particle size distribution and vertical variation of the dust concentration as well as the directed infrared radiative flux, is described. The vertical distribution of the aerosol density was measured on five separate ocassions. A mineralogical analysis of the collected aerosols indicated that quartz was their major constituent. The nocturnal radiation measurements showed several features which suggested that the infrared radiation was being influenced by the atmcspheric dust. Radiative transfer equations were formulated in an attempt to compare the difference between the observed and calculated upward infrared flux data tc the simultaneously measured aerosol values. Based on the assumption that all the particles were composed of quartz, the Mie theory was used in conjunction with the observed aerosol size distributions and mass concentrations to calculate the wavelength dependent optical parameters of the particulates (i.e., efficiency factors, scattering albedoes and phase functions). The radiative transfer equations were developed in terms of a model in which the pertinent parameters could be varied so that their effect on the infrared radiative flux could be investigated. Regression analysis was then used to re-examine the relation between the observed-calculated flux differences and the atmospheric aerosols by using the radiation observations as input into a slightly modified form of the transfer equations. This study indicated that these differences were largely explained by a positive contributicn from aerosol scattering. Finally, an expression was presented which relates the amount of atmospheric dust to the additional radiative diabatic cooling resulting from this dust.##

11597

Bullrich, K., W. Blattner, T. Conley, R. Eiden, G. Hanel, K. Heger, and W. Nowak

CONTRIBUTION TO THE POLARIZATION OF THE SKY RADIATION. In: Research on Atmospheric Optical Radiation Transmission. (Interim Scientific Report No. 6.) Johannes Gutenberg-Univ., Mainz (West Germany), Meteorologisch-Geophysikalisches Institut, Contract F 61052 67 C 0046, AFCRL-68-0186, p. 51-55, 81, Jan. 1968. 28 refs.
CFSTI, DDC: AD 670210

The variation of the maximum degree of polorization of the sky light is discussed as a function of each of the following parameters: turbidity, wavelength, exponent of the aerosol particle size distribution, zenith distance of the sun, and albedo. The conclusions drawn are of qualitative nature. New measurements of the degree of polorization have been carried out at Mainz to get an insight in the dayly variation of the atmospheric aerosol size distributions and other parameter which influence the spectral distribution of the sky radiation. It could be shown the significance of the behaviour of the two polarization maxima in the sky radiation.##

11599

Bullrich, K., W. Blattner, T. Conley, H. Eiden, G. Hanel, K. Heger, and W. Nowak

THE INFLUENCE OF SECOND ORDER SCATTERING ON THE SKY RADIATION AND ON THE RADIATION EMERGING FROM THE EARTH'S ATMOSPHERE UNDER THE ASSUMPTION OF A TURBID ATMOSPHERE. In: Research on Atmospheric Optical Radiation Transmission. (Interim Scientific Report No. 6) Mainz Univ. (West Germany), Meteorologisch-Geophysikalisches Institut, Contract F 61052 67 C 0046, AFCRL-68-0186, p. 63-83, Jan. 1968. 28 refs.
CFSTI, DDC: AD 670210

The influence of second order scattering on the sky radiation and on the radiation emerging from the earth's atmosphere under assumption of a turbid atmosphere has been investigated comprehensively. The great influence in the case of short wavelength and high turbidity can be seen. The amount of the secondary scattering near the horizon is 80% of the primary scattering. The theory of scattering is discussed, and graphs of data are presented.##

11624

Berger, A. W., C. E. Billings, H. Dennis, D. Lull, and P. Warneck

STUDY OF REACTIONS OF SULFUR IN STACK PLUMES. (FIRST ANNUAL REPORT APRIL 12, 1967 TO APRIL 11, 1968.) GCA Corp., Bedford, Mass., Technology Div., Contract PH-86-67-125, GCA-TR-68-19-G, 129p., March 24, 1969. 30 refs.

The overall objective was to provide an improved rationale for predicting the concentration levels of sulfur oxides in the atmosphere. The study has been divided into two major phases; (a) a field program in which real plumes from coal and oil-fired power stations can be tracked by aircraft to determine plume composition as a function of downwind distance, environmental factors and source parameters; and (b) a laboratory program in

which flue gas effluents generated by a pilot plant furnace (oil and coal fired) can be studied under simulated field conditions. Bench scale experiments to investigate several alternative mechanisms (chemical and/or physical) contributing to observed SO2 losses in the atmosphere are also included in the first-year program. Two Boston area power plants, one coal fired and the other oil fired, are allowing measurement of source parameters. The selected coastal stations are located such that no interference between their respective plumes takes place during periods of off-shore winds. Plume sampling was conducted under pre-selected meteorological conditions which would allow for maximum plume stability. Plume location beyond the visible range was determined by an automatic conductivity analyzer. A 42-cu ft reaction chamber was constructed to investigate atmospheric behavior of SO2 from stack plumes under controlled temperature, humidity, and simulated solar irradiation. Bench scale experiments were performed in which quantum yields were determined for pure SO2 and mixtures of SO2 for various uv excitation levels, 2537 and 3100A, at ambient pressure.##

11635

Altshuller, A. P.

COMPOSITION AND REACTIONS OF POLLUTANTS IN COMMUNITY ATMOSPHERES. Bull. World Health Organ. (Geneva), 40(4):616-623, 1969. 26 refs.

Data are presented showing the composition of gaseous and particulate substances in community atmospheres, based on measurements in various cities in the United States. Many of the pollutants react further, usually to produce substances as undesirable as the original ones, or more so; most of these reactions involve thermal oxidation or photooxidation. Because of the importance of considering air pollution on a regional or even continental scale, a general framework of residence times of pollutants is postulated; up to several days under adverse conditions in many regions, but less than 24 hours across large urban areas under more usual conditions of wind speed and movements of weather fronts. Pollutants and other atmospheric substances are categorized as either reactants-those substances emitted directly into the atmosphere from combustion, industrial, and biosphere processes; or products such as nitrogen dioxide and sulfates. Some substances may fall into both groupings. Data are given on rates of various reactions, and the nature of the products is described. In general, the measurements showed 1% to 15% conversions of gaseous to particulate species on a long-term basis; rates of conversion of nitrogen dioxide to nitrate were consistently lower than those of sulfur dioxide to sulfate. Recent work on particle size distributions of various metallic and non-metallic ions in particulates in U. S. cities is reviewed, with data given in terms of mass median diameters. It is pointed out that the biosphere is a source of, as well as a sink for, pollutants, and that urban levels of methane or nitrous oxide, for example, reflect to a considerable extent biosphere, rather than urban, emissions. Reactions originating in biosphere processes may contribute significantly to regional pollution, particularly during periods of stagnation. The need for increased

emphasis on atmospheric investigation, as opposed to laboratory work, and for improved sensitivity and specificity in monitoring and sampling is discussed.

11713

Bornstein, R. D.

OBSERVATIONS OF THE URBAN HEAT ISLAND EFFECT IN NEW YORK CITY. J. Appl. Meteorol. 7(4):575-582, Aug. 1968. 13 refs.

Differences in the temperature fields through the lowest 700 m of the atmosphere in and around New York City during the hours near sunrise are analyzed. Data were obtained by an instrumented helicopter on 42 predetermined test mornings from July 1964 to December 1966. The flight (shown on a map) began at Westchester County Airport, continued over Manhattan, Brooklyn, Staten Island, and ended at Linden Airport. Results show urban surface temperature inversions to be less intense, and far less frequent, than those in the surrounding non-urban regions. A high frequency of weak elevated inversions layers at an average height of 310 m was observed over the city. The average intensity of the urban heat island, i.e., urban temperature excess, was a maximum near the surface and decreased to zero at 300 m. On mornings with relatively strong urban elevated inversion layers the heat island extended to well over 500 m. For more than two-thirds of the test mornings there existed an elevated "cross-over layer" in which rural temperatures were higher than urban temperatures. The magnitude of the cross-over effect was less than that of the heat island effect.##

11714

K. Bullrich, R. Eiden, R. Jaenicke, W. Nowak

SOLAR RADIATION EXTINCTION, SKY RADIATION, SKY LIGHT POLARIZATION AND AEROSOL PARTICLE TOTAL NUMBER AND SIZE DISTRIBUTION ON THE ISLAND MAUI (HAWAII). Pure Appl. Geophys. (Milan) 69(1):280-319, 1968. 29 refs.

Solar radiation within the wavelength range of 0.4 micron to 1.0 micron undergoes extinction due to the air molecules as well as to the aerosol particles suspended in the atmosphere. If the absorption bands of water vapor are avoided by suitable interference filters, the extinction measured at solar elevations (which are not very low) is almost all due to scattering. There is evidence that the spectral distribution and the degree of polarization of diffuse sky radiation are sensitive to the number and size of atmospheric particles. The island of Maui is suitable for such an investigation since measurements can be taken above the trade wind inversion on the summit and below the inversion at the foot. Inversion almost completely prevents a direct exchange of aerosol particles between sea level and an

elevation of 3,050 m. During April 1964 and August and September 1965, field studies with regard to the total number of particles per cu cm, the aerosol particle size distribution per cu cm, and spatial distribution of the spectral degree of polarization, were carried out. The results are given in 26 figures and discussed in terms of theoretical values. It was found that the measured aerosol size distribution of a volume of air on the summit follows a power law only approximately with the exponent v*=3. At sea level the exponent is between 2 and 3.##

11724

I. Foitzik, D. Spankuch, E. Unger

COMPUTATION OF THE SCATTERING FUNCTIONS OF THE HAZE FROM SKYLIGHT MEASUREMENTS, CONSIDERING THE MULTIPLE SCATTERING
Pure Appl. Geophysics (Milan), 69(1):260-279,1968. 11 refs.

The primary scattering of atmospheric haze is computed by modification of an approximative method evolved by De Bary, basing on skylight measurements carried out on a mountain (3,000 m high in Bulgaria) at various altitudes of the sun and in different horizontal circles at a wave length of 450 nm. This measured total radiation is reduced by the radiation induced by the scattering at molecules as well as by secondary or multiple scattering at turbidity aerosol. The single scattering of the atmospheric haze thus computed is discussed for various assumed Linke turbidity factors. Haze scattering functions are compared with theoretical scattering functions. The results attained agree closely with superimposed logarithmic Gaussian distributions and only partly with the scattering functions computed by Bullrich. These deductions prove optically the increase of larger particles during forenoon. The analysis of the scattering functions shows a shortage of particles in agreement with other investigations.##

11902

Groll, A.

DETERMINATION OF A RADIATION INDEX NEEDED FOR THE ESTABLISHMENT OF DIFFUSION TYPES FROM SYNOPTIC WEATHER DATA. ((Bestimmung eines fur die Festlegung von Ausbreitungstypen erforderlichen Strahlungsindex aus synoptischen Wetterbeobachtungen.)) Text in German. Meteorol. Rdsch., 21(3):69-72, 1968. 4 refs.

The radiation index NRI which is used together with the wind velocity to determine the diffusion type in Turner's method is calculated from data on cloudiness, the solar height of the cloud cover. As shown by an analysis of hourly data obtained from the Hamburg airport and the Hamburg Metecrological Observatory in 1965, however, the NRI index correlates poorly with measured values of total insolation. A new radiation index (GI) is

therefore proposed which increases stepwise from 0 to 4 as the measured total insolation increases from 0 to 6.7, 20.2, 33.9, and 44.7 cal./cm2 hr. or higher. In crder to obviate the need for measurements of total insolatien, an empirical relationship was derived between it and data on cloudiness and solar height. When the total insolation calculated in this way is used to calculate the radiation index GI and the diffusion type, the results show a better correlation with the measured insolatien data. As exemplified by calculations fcr both Hamburg and Frankfurt, the net result of this improvement in Turner's method is a decrease in the relative frequencies of diffusion types 3 and 4 and an increase in types 1 and 2.##

11911

R. Reiter

AN EXPANDED TELECOMMUNICATIONS SYSTEM FOR RECORDING AEROLOGICAL DATA FROM CABLE-CAR GONDOLAS: STUDIES WITH AEROSOLS IN INVERSIONS. ((Die erweitert Fernubertragungsanlage zur Registrierung aerologischer Daten vcn Seilbahngondeln - Aerosolstudien an Inversionen.)) Text in German. Meteorol. Rdsch., 21(3):73-81, 1968. 11 refs.

Further details are given on a measurement and communicatiens system which makes possible the ccntinucus measurement and transmission to the control station in the valley (a difference of 1050 meters), of not only the temperature readings on the dry and wet thermometers in the gondola, but also the positive and negative air conductivity and the potential gradient as a function of atmospheric pressure. In the control station, these data are autcmatically graphed against air pressure as the gondola makes its ascent. Circuit diagrams and block diagrams are provided for the devices used to measure polar conductivity and potential gradient, as well as for the electrcnic equipment in both the gondola and the receiving station. Recording techniques and the basic principles underlying the interpretation of the results are also reviewed, after which scme representative data obtained during the fall of 1967 are analyzed. Using data recorded during inversions it is shown how the vertical distribution of the aerosol particles can be derived frcm the vertical gradient of air conductivity, and how this makes possible the calculation of vertical exchange ccefficients fcr intervals of altitude which can be as small as desired. These partial exchange coefficients can be related to the metecrolcgical fine structure in the same thin layer of the atmosphere. It is demonstrated that the vertical exchange coefficient is related to the slope of the temperature gradient in the area of the inversion, not the absolute temperature difference.##

12077

Dave, J. V., and C. L. Mateer

THE EFFECT OF STRATOSPHERIC DUST ON THE COLOR OF THE TWILIGHT SKY. J. Geophys. Res., 73(22):6897-6913, Nov. 15, 1968. 35 refs.

The chromaticity of the scattered radiation received by a terrestrial observer from different parts of the sky during twilight has been evaluated for six different model atmospheres. The first model is free of atmospheric ozone and dust, the second one contains 0.242 atm cm of O3 but no dust, whereas the remaining four models contain both O3 and dust. The evaluation method involves rectilinear propagation (no refraction) and the single scattering of direct sunlight. The computed chromaticities for the various models are discussed in terms of certain classically observed features of the twilight, namely, the purple light (Main and secondary), the increased blueness of the zenith sky during twilight, and the anti-twilight arch and the dark segment. The main purple light phenomenon cannot be explained by single scattering in a purely molecular atmosphere; the presence of stratospheric dust is found to be essential. Although certain features of the secondary purple can be explained by primary scattering in an upper stratospheric dust layer, chromaticities based on accurate calculation of both primary and secondary scattering will be required before a selection can be made between the secondary-scattering explanation and the upper dust-layer explanation of the secondary purple. The increase in zenith sky blueness during twilight requires the presence of O3 in the atmosphere; dust contributes to an increased blueness at all twilight solar zenith angles. The observed chromaticities of the anti-twilight arc and the dark segment cannot be reproduced in the model calculations and, therefore, must be produced by multiple scattering. (Author's Abstract)##

12105

Levine, Myron

ATMOSPHERIC CHEMICAL REACTIONS-AIR POLLUTION. Lockheed Aircraft Corp., Burbank, Calif., Rept. 15055, 45p., Feb. 17, 1961. 37 refs.

The smog process in the Los Angeles Basin is summarized and the reduction of ozone by iodine is proposed. As determined in an aluminum-covered reaction chamber, the thermal decay rates of ozone at 54-119 F are 0.53 to 1.59 times 0.001 reciprocal min. The decay is a first-order surface-catalyzed reaction having an activation energy of 5.2 kcal. In dark and in sunlight, iodine reacts with ozone in purified air with an O3:I2 ratio of about 4.51, which is equivalent to that required for the formation of iodous iodate. The reaction rate in sunlight is faster than in the dark, probably because of the increased dissociation by photoenergy of the iodine molecule to energetic iodine atoms prior to the reaction with ozone. In a photochemical smog atmosphere, iodine reacts to reduce the ozone concentration by an O3:I2 ratio of approximately 7:1. It is postulated that the increased effectiveness of the iodine in reducing ozone in smog atmosphere over that in purified air is the result of the quenching by the iodine of the free radical chain which generates ozone. (Author summary modified)

12165

E.Y.H. Keng, C.C. Wellons, C. Orr, Jr.

HYSTERESIS IN SMOG AND FOG DISAPPEARANCE (FINAL TECHNICAL REPORT.) Georgia Inst. of Tech., Atlanta, Engineering Experiment Station, Proj. B-330, 63p., Feb. 1969. 26 refs.

The behavior of sodium chloride aerosol particulates under various humidity conditions was investigated. The effects of foreign vapors such as methylamine and sulfur dioxide were studied. A small quantity of methylamine in the aerosol was found to promote condensation on the sodium chloride particulates when the relative humidity was increased and was found to retard evaporation of sodium chloride solution droplets when the relative humidity was decreased. This is because the dew point temperature of the aerosol is increased by the presence of the methylamine. Sodium chloride crystals at a room temperature of 75 degrees F will dissolve into droplets when the dew point temperature of the methylamine-free aerosol is above 66.5 degrees F. This would not occur until the dew point of the aerosol was above 70.5 degrees F when the aerosol contained only 0.1 per cent methylamine by volume. This is because the solubility and the dissolution rate of sodium chloride are retarded by the presence methylamine in condensed water. Evaporation of sodium chloried solution droplets in air containing sulfur dioxide seemed to be slower than in air alone when the concentration was high. No difference was detected on the growth of dry crystals, however. Ethanol vapor and Alpha-pinene did not affect either evaporation or growth for the conditions tested. Aerosols generated from sea water behaved similarly to those generated from sodium chloride solutions. (Authors' summary) **

12524

Pilipowskyj, S., J. A. Weinman, B. R. Clemesha, G. S. Kent, & R. W. Wright

INVESTIGATION OF THE STRATOSPHERIC AEROSOL BY INFRARED AND LIDAR TECHNIQUES. J. Geophys. Res., 73(24):7553-7560, Dec. 15, 1968. 19 refs.

Analysis of downward directed infrared irradiances measured in the tropical stratosphere indicated that reasonable limits on the gaseous composition of the atmosphere could not account for the irradiances observed between 14 and 24 km. Additional emitters were therefore assumed to exist at these altitudes. The altitude dependence of the additional emitter compared reasonably well with aerosol profiles derived from lidar backscatter measurements conducted simultaneously in the same region. Mie theory is applied to model aerosol size distributions; the results of such analysis are compared with data obtained at lambda = 0.69 micron and 3 micron less than lambda, less than 100 micron to provide estimates of the size distributions and mass density of the stratospheric aerosol at altitudes of about 18 km. (Author's Abstract) **

12626

J. I. Gordon

MODEL FOR A CLEAR ATMOSPHERE. J. Opt. Soc. Am., 59(1):14-18, Jan. 1969. 14 Ref.

A model of a clear atmosphere is presented based upon two assumptions: (1) The point-function equilibrium radiance for a given path of sight does not change with altitude; (2) there is no absorption. As a result of these assumptions, the equation of transfer can be integrated. The path radiance for any slant path becomes a function of the equilibrium radiance and the beam transmittance of that path. In addition, the equilibrium radiance is a function of the scalar irradiance from the sun, sky, and earth and the proportional directional scattering coefficient for ground level. Sky radiances, and path radiances through the atmosphere for both upward and downward paths are determined by four parameters; the proportional directional scattering function for ground level, the total vertical beam transmittance of the atmosphere, the scalar albedo, and the solar zenith angle. There is evidence that the real atmosphere does on some days conform to the above two assumptions to a useful extent for the visible portion of the spectrum. (Author's Abstract)##

12627

B. M. Herman, D. N. Yarger

ESTIMATING THE VERTICAL ATMOSPHERIC OZONE DISTRIBUTION BY INVERTING THE RADIATIVE TRANSFER EQUATION FOR PURE MOLECULAR SCATTERING. J. Atmospheric Sci., 26(1):153-162, Jan. 1969. 18 Ref.

A method of estimating the vertical distribution of ozone by inverting the equation of radiative transfer is presented. The method allows for all orders of scattering as well as polarization of the diffusely reflected sunlight. The information content of the reflected sunlight as a function of observation angle is examined for the case where perfect measurements are assumed, and also for the case where a 1% random error is introduced into the measurements. Inversion results utilizing simulated satellite measurements are presented for several different ozone soundings. (Author's Abstract)##

12632

J. J. Kelley, Jr.

INVESTIGATIONS OF ATMOSPHERIC TRACE GASES AND SUSPENDED

PARTICULATE MATTER ON MOUNT OLYMPUS, WASHINGTON. J. Geophys. Res. 74 (2), 435-43 (Jan. 15, 1969). 11 Ref.

Atmospheric CO2, water vapor, net oxidant, and suspended particulate matter were measured at the Blue glacier field station, Mount Olympus, Washington, during the summer of 1966. Diurnal variations of CO2, net oxidant, and water vapor are related to mountain and valley wind transport. Diurnal variations of CO2 and net oxidant have a phase nearly opposite to the typical diurnal variations in the rural lowlands. Concentrations of suspended particulate matter are lower than the concentrations of the urban and industrial areas of the Puget Sound region but generally follow the fluctuations of lowland concentrations. (Author's Abstract)##

12634

C. B. Leovy

ATMOSPHERIC OZONE. AN ANALYTIC MODEL FOR PHOTOCHEMISTRY IN THE PRESENCE OF WATER VAPOR. J. Geophys. Res., 74(2):417-426, Jan. 15, 1969. 22 Ref.

An approximate analytic model of stet photochemistry including reactions with hydrogen compounds is developed for the atmospheric region between 15 and 60 km. The reaction scheme is a simplified version of that used by B. G. Hunt. The model is used to study time-dependent processes, the sensitivity of the equilibrium-concentration values to uncertainties in reaction rates, and the variations in the equilibrium ozone concentration with latitude and season. There are five main results. (1) O3 loss in the model depends on the ratio of the rate of production of O(1D) and the rate of dissociation of H2O by O(1D), but the loss rate and equilibrium O3 concentration are not very sensitive to this ratio. (2) Below 40 km the model is quite sensitive to the rates of reaction of O3 with OH and HO2; these unknown reaction rates are the weakest link in the theory. (3) Above 40 km the relevant reaction rates are comparatively certain and the O3 concentration is very likely to be controlled by reactions of atomic oxygen with OH and HO2. (4) As a consequence of (3), the O3 concentration near the stratopause is probably not sensitive to temperature, and the dynamical damping sometimes attributed to this temperature sensitivity is likely to be unimportant. (5) If the model is correct, the photochemical time scale for O3 is much less than it would be if only O2 reactions control O3; consequently, in low latitudes, O3 may be subject to significant photochemical influence down to as low as 15 km. (Author's Abstract)##

12644

H. N. Ballard, R. Valenzuela, M. Izquierdo, J. R.

Randhawa, R. Morla, J. F. Bettle

SOLAR ECLIPSE. TEMPERATURE, WIND, AND OZONE IN THE STRATOSPHERE. J. Geophys. Res., 74(2):711-712, Jan. 15, 1969). 4 ref.

The occurrence of a total eclipse at Tartagal, Argentina, on November 12, 1966, prompted a rocket sounding experiment to determine temperature, wind, and ozone perturbations in the stratosphere caused by the eclipse. Soundings were made in the 65- to 30-km region of the atmosphere before, during, and after the total eclipse. Twelve rockets were successfully fired; nine of the rocket instruments were designed to measure temperature and three were designed to determine ozone concentration in the atmosphere. Wind speed was determined for each sounding from the trajectory of the radar-reflective parachute. (Author's Abstract)##

13758

Narita, Getsuei

METEOROLOGICAL STUDIES ON AIR POLLUTION IN MURORAN, HOKKAIDO (FIRST REPORT). (Muroran-shi no taiki osen ni kansuru kisho-chosa (daiichi ho)). Text in Japanese. Kishocho Kenkyu Jiho (Journal of Meteorological Research, Tokyo), 19(10):552-556, Oct. 1967. 1 ref.

In January, 1966, the city of Muroran was designated an air-polluted area. During the period of investigation (June 1965 to May 1966), two large iron industry plants located in the eastern part of the city emitted smoke which included SO2. Mist and/or smog was most frequently observed between 9:00 p.m. and 9:00 A.M., disappearing in the morning. A weak north-northeast wind was most frequently seen during periods of smog, while a west-north-west wind, which was slightly stronger than the former, was most frequently seen during the period of absence. An air-layer inversion, which caused the wide spread of smog, was clearly observed when the surface wind was north-east or southeast in direction, or when the temperature difference between air and sea water was great. High concentrations (more than 0.5 ppm) of SO2 were most frequently observed between 12:00 noon and 10:00 p.m., especially in November and March and when there was a strong (7 to 10 m/sec) northwest wind. Concentrations of SO2 were highest in the area within 1 km downwind from these plants.

14019

Altshuller, A. P.

COMPOSITION AND REACTIONS OF POLLUTANTS IN COMMUNITY ATMOSPHERES. Bull. World Health Organ. (Geneva), 40(4):616-623, 1969. 26 refs.

Data are presented showing the composition of gaseous and particulate substances in community atmospheres, based on measurements in various cities in the United States. Many of the pollutants react further, usually to produce substances as undesirable as the original ones, or more so; most of these reactions involve thermal oxidation or photooxidation. Because of the importance of considering air pollution on a regional or even continental scale, a general framework of residence times of pollutants is postulated: up to several days under adverse conditions in many regions, but less than 24 hours across large urban areas under more usual conditions of wind speed and movements of weather fronts. Pollutants and other atmospheric substances are categorized as either reactants-those substances emitted directly into the atmosphere from combustion, industrial, and biosphere processes; or products such as nitrogen dioxide and sulfates. Some substances may fall into both groupings. Data are given on rates of various reactions, and the nature of the products is described. In general, the measurements showed 1% to 15% conversions of gaseous to particulate species on a long-term basis; rates of conversion of nitrogen dioxide to nitrate were consistently lower than those of sulfur dioxide to sulfate. Recent work on particle size distributions of various metallic and non-metallic ions in particulates in U. S. cities is reviewed, with data given in terms of mass median diameters. It is pointed out that the biosphere is a source of, as well as a sink for, pollutants, and that urban levels of methane or nitrous oxide, for example, reflect to a considerable extent biosphere, rather than urban, emissions. Reactions originating in biosphere processes may contribute significantly to regional pollution, particularly during periods of stagnation. The need for increased emphasis on atmospheric investigations, as opposed to laboratory work, and for improved sensitivity and specificity in monitoring and sampling is discussed.

14411

McKay, H. A. C.

AMMONIA AND AIR POLLUTION. Chem. Ind. (London), 1969:1162-1165, Aug. 23, 1969. 15 refs.

The main oxidation product of sulfur dioxide in the atmosphere is often ammonium sulfate rather than sulfuric acid. The presence of ammonium sulfate aerosol has been previously demonstrated by chemical analysis and by identification of individual particles as ammonium sulfate crystals. There is experimental evidence that at typical atmospheric levels, the reaction between ammonia gas and sulfuric acid droplets is very fast so that the two cannot coexist for more than a few seconds. It is doubtful whether neutralization of free sulfuric acid represents the principal route to ammonium sulfate and a sufficiently fast mechanism for the oxidation of sulfur dioxide was difficult to explain. If oxidation in the presence of ammonia is considered, further possibilities arise, and the expected product is ammonium sulfate. This might occur in the gas phase, in water droplets, or in solid particulate matter. Different reaction

mechanisms are discussed. It appears that atmospheric ammonium sulfate is produced when ammonia contacts sulfur dioxide from combustion in the presence of a water droplet phase. About half the ammonia may react before a falling pH virtually stops the reaction. When no water droplets are present, the reaction may perhaps occur on solid particulates.

14698

Fletcher, J. O.

MANAGING CLIMATE RESOURCES. Rand Corp., Santa Monica, Calif., 30p., Feb. 1969. 45 refs.
CPSTI, DDC: AD 684386

Human activity is influencing climate on a global scale to the extent that purposeful management of climatic resources will become necessary. The influencing factors most frequently mentioned are carbon dioxide, smog (dust), and heat pollution. High CO2 concentrations decrease the radiative loss to space because the radiation comes from a higher, and hence cooler, level in the atmosphere. Increases in CO2 thus increase the 'greenhouse' effect and cause global warming. For the next few decades, the effects of heat pollution will be insignificant on the global scale. They will be important sometime in the next century. Smog, which includes all forms of industrial pollution, is probably responsible for a 30% turbidity increase per decade and for the temperature decline of recent decades. The most theoretically effective approaches to weather modification are not within the range of present day technology. On the other hand, various ways of influencing thermal losses and inputs to the atmosphere are presently achievable. The diversity of thermal processes that can be influenced in the atmosphere, and between the atmosphere and ocean, offers promise that climatic resources can be maximized and unwanted changes avoided. Engineering proposals for altering the pattern of thermal forcing of circulation indicate that a technological threshold has been reached from which progress can be proportional to the investment of effort. Scientific and government leaders must organize the necessary resources.

15308

Bockian, A. H., Frank Bonamassa, Herbert Faigin, and Herman Pinsky

USE OF THE INTEGRATING NEPHELOMETER TO MEASURE AEROSOL FORMATION FROM HYDROCARBONS. Preprint, California Air Resources Board, Los Angeles, 9p., 1969. (Presented at the Am. Chem. Soc., 158th Natl. Meet., New York, 1969.)

A recently-designed integrating nephelometer was used in

environmental chamber experiments to measure light scattering resulting from the irradiation of different hydrocarbons in the presence of nitric oxide at ppm levels. In some of the experiments, 2 ml of gasoline were used; in others, several individual alkene and aromatic components of gasoline, in concentrations of 2 ppm each, were irradiated separately in the presence of 0.4 ppm nitric oxide for about 5 hrs. Six ppm of some alkanes found in gasoline were also allowed to react individually with 0.4 ppm NO. Several other experiments were performed in which the hydrocarbon was allowed to react with ozone in the dark. Agreement in the amount of light scattering between duplicate runs was excellent. In several cases, large amounts of aerosol were produced while the net oxidant concentrations were at a fairly low level. It was shown that some short-chain olefins, which may be very reactive in producing oxidant and eye irritation, produced little or no aerosol; in contrast, many paraffins which were found to be non-reactive in eye irritation studies produced aerosol. A great many aerosol producers contain seven or more carbon atoms and do not seem to be restricted to any class of hydrocarbon; a possible synergistic action between a short-chain high oxidant producer and a large molecule which produces aerosol remains to be investigated. The agreement between nephelometer readings and visual measurements of visibility was excellent.

15347

Meyer, Erich

SULFUR DIOXIDE EMISSION AND SMOG FORMATION.
(Schwefeldioxid-Emission und Smog-Bildung). Text in German.
Chem. Ing. Tech., 41(19):1056-9, 1969. 13 refs.

In 1962, 35% of atmospheric SO2 in West Germany was emitted by thermal power plants, 46% by other industrial sources, and 19% by domestic heaters. In 1965, power plants emitted 29%, the remaining industrial and domestic sources 71%. The atmospheric SO2 concentration (mg SO2/cu m) depends on stack height, the amount emitted, distance from the source of emissions, and on meteorological factors. Among the latter, temperature-lapse rates have great importance. The formation of smog depends not only on SO2 levels and inversions, but also on the catalytic activity of finely divided solid particles, intense solar radiation, and high relative humidity. Measures for limiting SO2 emissions are outlined. These fall into three categories: decontamination of fuels or removal of the toxicants from waste gases, the use of low-sulfur fuels, and curtailment of industrial operations.

15390

Peterson, James T.

THE CLIMATE OF CITIES: A SURVEY OF RECENT LITERATURE.

Public Health Service, Durham, N. C., National Air Pollution Control Administration, Pub. AP-59, 48p., Oct. 1969. 127 refs.

The meteorological aspects of urban-rural climate are reviewed with respect to temperature, humidity, visibility, radiation, wind, and precipitation. The "heat island" effect (due to the center of a city being warmer than its environs) is discussed with reference to possible reasons for its occurrence; diurnal, weekly, and seasonal variations; relation to city size; and dependence on topography. The average relative humidity in towns is lower than that of rural areas; the average absolute humidity is only slightly lower in built-up regions. The differences in humidity are due to lower evaporation rates in a city because of the different surfaces. Variations within metropolitan areas resemble those of temperature, since the spatial temperature changes of a city are greater than those of vapor pressure. The atmosphere of metropolitan areas is characterized by increased concentrations of pollutants, such as smoke, which cause a difference between the visibilities of urban and rural regions. Fog is more frequent within urban regions because of the hygroscopic property of atmospheric particulates. The blanket of particulates over large cities causes the solar energy that reaches an urban complex to be less than that observed in rural areas, the particles being most effective as attenuators of radiation when the sun angle is low. The differences in wind speeds in city and country occur because the surface of a built-up city is rougher than that of rural terrain and because the heat island of a city causes horizontal thermal gradients. The excess heat and friction also produce more turbulence over the urban area.

15545

Duncan Rulon Cook

THE DISTRIBUTION OF OZONE POLLUTION IN THE SALT LAKE VALLEY: A PRELIMINARY GEOGRAPHICAL STUDY. Utah Univ., Salt Lake City, Dept. of Geography, Thesis (MS), Aug. 1968, 122p. 70 refs.

The horizontal and vertical distribution of ozone in the Salt Lake Valley was determined, and the distributional pattern related to man's activities and existing meteorological conditions. Sampling was carried out during eleven airplane flights in August and September, 1967, and June, 1968. A Mast Ozone Meter was used to measure the concentration of ozone in the air brought into the plane's cabin through glass tubing. The horizontal distribution was assessed by flying a series of transects over the valley. Vertical profiles of ozone concentrations were determined by spiralling over specific locations. A comparison of ozone levels was also made in outlying areas to those in the Salt Lake Valley. Results show a buildup of ozone during the day througout the valley with distributional patterns of high and low concentrations dependent on wind direction and its relation to the source area. In the morning, local down-valley winds carry the higher concentrations north and northwest of the city. In the afternoon, when winds, are up-valley, maximum concentrations are observed in the southern part of the valley.

Under strong southerly gradient winds, concentrations are lower than during local winds. They remain low in the southern part of the valley throughout the day, increase slightly northward in the region of greater human activity, and reach a maximum north and northwest of Salt Lake City. In thy valley, a buildup in the vertical distributicn of ozone in the lower elevations is evident. During midday, the ozone shows higher concentrations near the ground under stable atmospheric conditions and low wind velocities. With greater wind velocities, higher ozone concentrations are mixed tc a higher altitude. Ozone concentrations in Salt Lake City are two to three times greater than those in outlying areas. (Author abstract modified)

15712

WHERE DOES IT ALL GC. Stanford Res. Inst. J., 23:4-8, Dec. 1968.

The Environmental Research Department of Stanford Research Institute undertook a glcbal study of the atmosphere. The world and its surrounding atmosphere were considered as a complete system. Estimates were made of the amount of sulfur compounds, nitrogen compounds, organic ccmpounds, and incrganic carbon ccmpounds discharged to the air by automobiles, home furnaces, or power plants. Calculaticns were made of the amount of the material in the atmosphere. By comparing the twc figures it was possible to estimate how effectively nature removes pollutants from the atmosphere. Included in the atmospheric balance was the amount of material contributed by nature since there are natural sources for a wide variety of gaseous materials and particles which are classed as air pollutants when they are emitted by man's activities.

15713

Raff, R. A. and G. M. Meaburn

PHOTOCHEMICAL REACTION MECHANISMS FOR PRODUCTION OF ORGANIC COMPOUNDS IN A PRIMITIVE EARTH ATMOSPHERE. Nature, 221(5179): 459-460, Feb. 1, 1969. 19 refs.

Thermodynamic considerations dictate the existence of a reducing atmosphere on the earth during the synthesis of prebiological organic compounds. Some of the reactions by which a primitive atmosphere might have given rise to reduced compounds of C and N are explored. The assumptions on which the discussion is based are: (1) The total amount of hydrogen on the earth was larger than it is now and was present primarily as water; (2) the gases of the atmosphere were produced in the crust of the earth at high temperatures by the reaction cf water with metals, carbides, nitrides, etc.; (3) the outgassing occurred over a considerable span of geological time. The outgassed atmosphere was subjected tc a variety of reactions induced by solar radiation and electrical discharges.

15729

Kozyrev, B. P. and V. A. Bazhenov

THE ROLE OF N2O, CH4 AND CO IN ATMOSPHERIC ABSORPTION IN THE INFRARED. (Rol' malykh atmosfernykh primesey v pogloshchenii infrakrasnoy radiatsii). Text in Russian. Fiz. Atm. i Okeana (Moscow), 5(7):738-744, 1969. 8 refs.

The transparency of minor atmospheric impurities is interpreted in the form of a function of the mass of absorbing gas divided by the equivalent mass of gas needed for 50% absorption at a given wavelength. This function fits available data with a scatter of not more than 8%. When taking into account, the non-uniformity of the atmosphere by the effective mass method, the selection of the fitting parameter (n) may lead to significant error in calculating transparency (T). If the average radiation absorption (A) at the center of the nitrous oxide methane and carbon monoxide and bands varies from 10-90%, then (n) may be selected so that the maximum absolute error in calculating transmission will not exceed plus or minus 14%. Taking into account the variability of (n) with the mass of the gas and the pressure reduces the error in calculating the transparency of minor components to plus or minus 5-7%. Calculating the transparency of various air masses in the centers of N2O, CH4 and CO absorption bands indicates the significant role of minor atmospheric components in the attenuation of infrared radiation.

15831

Lea, Duane A.

VERTICAL OZONE DISTRIBUTION IN THE LOWER TROPOSPHERE NEAR AN URBAN POLLUTION COMPLEX. J. Appl. Meteorol., 7(2):252-267, April 1968. 38 refs.

From May to December 1965 and from June 1966 to June 1967, balloon-borne ozonesondes were flown from Point Mugu, California once each week to study ozone in the stratosphere. High ozone amounts were frequently observed over low altitudes. To examine the apparent relationship between ozone fluctuations and local circulation variations, the lower tropospheric portion of each sounding was hand or computer reduced and analyzed for maximum detail. The highest ozone concentration cases presumably associated with the influx of smoggy pollution from the nearby Los Angeles Basin. But even when the arriving air's trajectory was more obscure, distinct ozone maxima were frequently measured in association with stable strata aloft. Urban pollution is thought to be the major source for at least the stronger maxima observed. Subsidence may be a lesser contributing factor. The soundings showed a pronounced tendency for the maximum ozone to occur above the base of the low-level temperature inversion. A possible explanation might involve lifting of the Los Angeles pollutant into the inversion by convection and orography, followed

by modification enroute to Point Mugu by differential erosion across the marine boundary layer and by differential advection in mesoscale circulations. From the persistence of observed ozone maxima in the soundings, the semipermanent temperature inversion over coastal southern California appears to be an effective reservoir for atmospheric ozone. It seems likely that the stored ozone can be brought down to the surface by inversion undulations or by penetrative convection so as to contribute to existing surface pollution. The data obtained suggest that ozone sampling offers promise in deducing local airmass histories and as an indirect indicator of air flow over noninstrumented areas. To the extent that ozone gradients may be characteristic of local airmass boundaries near urban pollution complexes. Ozone measurements might offer feasible means of delineating such local circulation features as land and sea breezes, Santa Ana wind systems, and mesoscale eddies.

16131

Charlson, R. J. and M. J. Pilat

CLIMATE: THE INFLUENCE OF AEROSOLS. J. Appl. Meteorol., 8(6):1001-1002, Dec. 1969. 4 refs.

A method is presented for estimating the relative effect of light scattering and absorption of particles on the climate. The atmosphere is considered to be a flat, nearly transparent, thin, uniform scattering and absorbing layer above the earth's surface. The incoming radiation from the sun in the zenith is presumed to be affected by aerosols while outgoing radiation is not. The amount of energy absorbed (W) in unit time by the earth-atmosphere system is the sum of the absorption at the surface and by the atmosphere. It is shown that the a backscattering, non-absorbing aerosol would clearly decrease W, thereby cooling the earth-atmosphere system. The effects of the extinction coefficient of absorption, however, are two-fold. Since the fractional absorption of the surface is less than 1, any increase in the extinction coefficient of absorption results in an increase in W for a given extinction coefficient of backscatter. The location of heating is removed from the surface to higher in the atmosphere, resulting in increased static stability as well as increased W. The effect of a secular increase in aerosols might be an increase or a decrease in W, depending on the relative magnitudes of the extinction coefficients due to absorption and backscatter and the absolute magnitude or the extinction coefficient due to absorption. It is possible to estimate relative values for the extinction coefficients due to absorption and backscatter in order to determine which dominates. The net climatological effect of industrial smoke, which contains light-absorbing substances such as carbon and iron oxide could well be to heat, not cool, the earth.

16342

Khrgian, A. Kh.

RECENT INVESTIGATIONS ON ATMOSPHERIC OZONE. (Noveyshiya issledovaniya po atmosfernomu ozonu). Text in Russian. Fiz. Atm. i Okeana (Moscow), 5(4):435-438, 1969.

The Symposium of the International Commission on Atmospheric Ozone, held September 2-7, 1968 at Monte Carlo, Monaco is reviewed. Brief comments are made regarding contributions touching upon the following subjects: a photometric model of the ozone layer; reactions occurring in the dry and moist stratosphere; the role of fast electrons on O3 dissociation; the process of ozone formation; the role of the troposphere as a strong ozone source; the precision and usefulness of the reversal method of ozone study instances of observed secondary reversal; studies of the absorption coefficient of ozone and precision of its determination; diurnal ozone variations in southern latitudes; the role of vertical movement and activation on ozone photochemistry; effects of intrusions of cold ozone-rich air in a thin layer over isentropic surfaces; the distribution of ozone in high-altitude cyclones and anticyclones; the relationship of stratospheric flows to sharp changes in ozone content in lower layers; ozone concentration over the North Atlantic; and photochemical and advective factors affecting ozone redistribution.

16390

Bullrich, K., R. Eiden, G. Eschelbach, K. Fischer, G. Haenel, K. Heger, H. Schollmayer, and G. Steinhorst

ELLIPTICAL POLARIZATION OF THE SKYLIGHT AND THE ATMOSPHERIC AEROSOL. In: Research on Atmospheric Optical Radiation Transmission. Dec. 1, 1967 - Nov. 30, 1968. (Final Report.) Johannes Gutenberg-Universitaet, Mainz, Germany, Inst. fuer Meteorologie, OAR Contract F 61052 67 C 0046, AFCRL-69-0266, p. 1-4, 108-111, Jan. 1969. 38 refs.

Elliptical polarization of skylight was measured in the heavily polluted Rhine-Mainz area. The ellipticity tan Beta was plotted as a function of the azimuth angle alpha, with tan Beta defined as the ratio of the greater to the smaller axis of the ellipse which is traced by the electrical vector. Measurements taken along various horizontal circles of constant elevation at a constant wavelength showed the same trend. Ellipticity was zero at alpha equals 0 deg and alpha equals 180 deg. A maximum was located between 40 and 90 deg as tan Beta equals 0.1 or less, depending on the turbidity and elevation of the observation circle. From this maximum, ellipticity decreased continuously in both directions. In cases of great turbidity when the visual range was less than 5 km, measurements showed no ellipticity. The production of elliptically polarized light is assumed to result from higher order scattering processes and the absorptive properties of atmospheric aerosols.

16392

Bullrich, K., R. Eiden, G. Eschelbach, K. Fischer, G. Haenel,

K. Heger, H. Schollmayer, and G. Steinhorst

PRELIMINARY RESULTS OF COMPUTATIONS OF THE AEROSOL SCATTERING FUNCTIONS OBTAINED FROM POPULATIONS FOLLOWING POWER LAW PARTICLE SIZE DISTRIBUTION. In: Research on Atmospheric Optical Radiation Transmission. Dec. 1, 1967 - Nov. 30, 1968. (Final Report.) Johannes Gutenberg-Universitaet, Mainz, Germany, Inst. fuer Meteorologie, OAR Contract F 61052 67 C 0046, AFCRL-69-0266, p. 30-35, 108-111, Jan. 1969. 38 refs.

Computations of aerosol scattering functions are based on various refractive indices for the scattering functions of populations of spheres whose particle size distributions follow power laws. Boundary radii chosen for power law distributions were 0.04 and 10 micron. Measurements made at the wavelength of light lambda equals 0.4 micron show the influence of both the real and the imaginary part of the complex index of refraction on the scattering function. The intensity of the scattered light increases with increasing real part and decreasing imaginary part of the index. The angular dependence of the scattering function increases with decreasing real part and increasing imaginary part of the index. Changes in the relative humidity of the ambient air also influence scattering functions. Estimations of the scattering function for lambda equals 1.6 micron at different humidities show that at scattering angles less than 15 deg, the forward scattering increases with increasing relative humidity; at scattering angles greater than 15 deg, the scattering function decreases with increasing relative humidity. At an angle of 30 deg, the reduced scattering function for power law distribution is almostt idependent of the refractive index, and the scattering coefficient is almost equal to the extinction coefficient.

16405

Valko, P.

RELATIONSHIP BETWEEN TURBIDITY FACTOR AND TURBIDITY COEFFICIENT. (Ueber den Zusammenhang zwischen Truebungsfaktor und Truebungskoeffizient). Text in German. Arch. Meteorol., Geophys., Bioklimatol., Ser. B, 15(4):359-375, 1967. 17 refs.

The measurement of atmospheric turbidity by determining the solar intensity can indicate the rate of air pollution. If the turbidity is to be studied over a period of several years, the methods of evaluation may have changed and thus, different turbidity measurements may have to be compared with each other. A diagram was developed for the conversion of the turbidity factor for total radiation by F. Linke into the turbidity coefficient by W. Schuepp and vice versa with sufficient accuracy. The conversion takes into account the precipitable water content of the air and of the optical air mass. The extensive measurements taken at Locarno-Monti (southern Switzerland) are used to analyze the influence of the wave length exponent alpha on the conversion. Empirical formulas are compared with those provided in the literature and with the theory.

16458

Andreyev, B. G. and R. F. Lavrinenko

SOME DATA ON THE CHEMICAL COMPOSITION OF ATMOSPHERIC AEROSOLS IN CENTRAL ASIA. (Nekotoryye dannyye o khimicheskom sostave atmosfernykh aerozoley Sredney Azii). Text in Russian. Meteorol. i Gidrol., no. 4:63-69, 1968. 3 refs.

Central Asia is one region of the USSR whose atmosphere is severely polluted due to large areas covered with sand deserts and loesses, dryness of the climate, and high frequency of strong winds. Aside from their purely meteorological import, studies of the concentration and chemical composition of atmospheric aerosols are of direct interest in many engineering problems (corrosion of electric power lines, operation of natural-gas line compressors, etc.) and in the fields of sanitation and hygiene. This paper presents some results of the first such study carried out in Central Asia during September and October, 1966. Aerosol samples were collected near the ground and from aircraft in daytime horizontal flights at the 300 and the 600 meter altitude and in one flight in a sandstorm at the 300 meter altitude, by means of membrane and FPP-15 fabric filters as well as a twin-chamber trap with a water filter, separating particles of a size smaller than about 0.5 microns from those which are larger. In addition, samples of sandy soil, sierozem (gray desert soil) and solonchak (saline soil), most prevalent in Central Asia, were analyzed and the results compiled in a table. The chemical composition of the soluble constituents of aerosols and that of aqueous extracts of the surface layer of the soils was determined by the method of sediment analysis. The mean values of 30 series of aerosol measurements are given in tables as follows: HCO3(-), SO4(2-), Cl(-), NO3(-), Na(+), K(+), Mg(2+), Ca(2+), and NH4(+). The total ion concentration and the soluble part in micrograms per cubic meter, as well as the hydrogen ion concentration, expressed in terms of pH value, are also given. The relations existing between the compositions of the soils and of the aerosols at various altitudes, among the ionic components of aerosols, and between particle size and acidity of the molecular species constituting the aerosols are discussed.

16534

Itoo, Kyoji

SOME METEOROLOGICAL PROBLEMS CONCERNING TO PUBLIC NUISANCE PROTECTION ON AIR POLLUTION METEOROLOGY. (Kogai taisakumen kara toraeta kishogakuteki shokosatsu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 1(2):74-79, June 15, 1965.

Stack meteorology, which deals with almost the same field as general meteorology, has occupied an important position in air pollution control. In reality, however, neither field meets the current needs of air pollution control programs, with differences between the two approaches requiring the establishment of a third

field, air pollution meteorology. Stack meteorology is primarily concerned with the analysis of the shape of a smoke plume and with formulas for smoke diffusion and chimney heights required for effective diffusion. Consequently, meteorological conditions which have apparent effects on the smoke shape occupy a large part of stack meteorology. While a smog source obviously originates pollutants, it does not always produce the same results. This means that smoke may turn to smog one day but not on another day, even under similar operating conditions. This is why air pollution meteorology is needed. Meteorological conditions likely to give rise to the smog phenomena are weak winds, temperature inversions, and dense fog. The experience of some plants indicate that a gust of wind can increase SO2 density. This is designated as a gust-of-wind pollution. In general, it accounts not only for wind velocity or direction, but also for the relationship between the height of the pollution source and that of surrounding buildings.

16554

Fukuoka, Saburo and Toshio Odaira

AIR POLLUTANTS AND METEOROLOGICAL ASPECTS AT THE SMOG ALERT ISSUANCE IN TOKYO. (Tokyoto ni okeru sumoggu chuiho hatsureiji no osenshitsu nodo to kishyo jyoken). Text in Japanese. Kogai to Taisaku, (J. Pollution Control), 2(11):757-766, Dec. 1966.

Ten smog alerts issued in Tokyo during the past four years are analyzed in meteorological terms. Two levels of pollution status prescribed in the issuance standard are smog caution, which is issued when sulfur dioxide concentrations at two observation centers simultaneously exceed 0.2 ppm for two to three hours and smog alert, which is issued when SO2 concentrations measured at the main observation center exceed 0.5 ppm. In all cases, the smog alert was given between 9 a.m. and 11 a.m. This is probably attributable to the fact that high SO2 concentrations are emitted by industry in the first three hours of the workng day. The duration of the alarms averaged 6 hours and 40 minutes. This means the high concentrations of SO2 lasted for about 10 hours. There were exceptional cases which showed a significant relationship between weather conditions and SO2 concentrations. The peak of SO2 pollution was reached between 4 and 5 p.m. and followed by a slow descent. Analysis of wind and temperature data reveals that southern winds are closely related to the occurrence of high SO2 concentration and their diffusion, especially south-southeast winds. It is conjectured that some of gaseous pollutants originating in the Tokyo-Yokohama industrial area are carried directly to the Tokyo sky, while the remainder are first carried aloft over Tokyo Bay and then blown back by sea breezes.

16618

Kelley, John J., Jr.

CARBON DIOXIDE AND OZONE STUDIES IN THE ARCTIC ATMOSPHERE. In: Arctic Drifting Stations: A report on Activities Supported by

the Office of Naval Research. J. E. Sater (coordinator), Washington, D. C., Arctic Inst. of North America, 1968, p. 155-166. 27 refs. (Also: Washington Univ., Seattle, Dept. of Atmospheric Sciences, Contract NONR-477(24), TR-38, 1969.)
DDC: AD 685571

Measurements of atmospheric carbon dioxide and surface ozone concentrations at Barrow, Alaska are reported. Continuous carbon dioxide monitoring began in 1961 and continuous ozone monitoring in 1965. Carbon dioxide concentrations are found to increase in the late spring and then to decrease to a summer minimum, which corresponds closely to the maximum vegetation bloom on the tundra. When the tundra surface is frozen, daily CO2 concentrations show strong gradients between the surface and 16-m level. These fluctuations depend on wind speed, temperature, and snow cover. There is much less fluctuation in atmospheric CO2 when the tundra is in bloom. The vegetation bloom period is thought to provide a sink for CO2. During the year, ozone fluctuates at Barrow from less than 1 pphm to more than 7 pphm. Variations in surface ozone concentration show much greater variability during the winter and early spring than in the summer and fall. Large fluctuations in ozone near the ground are nearly always correlated with storm front passages. All increases in ozone correspond to a rise in ambient air temperature, increased wind speed, and decreased atmospheric pressure. Aircraft sampling is suggested to supplement ground-level monitoring data.

16683

Bullrich, Kurt

SCATTERING OF ELECTROMAGNETIC RADIATION BY PARTICULATE SUSPENSIONS IN THE ATMOSPHERE. In: Scatter Progagation of Radio Waves. Part I. Proc. AGARD Conf. no. 37, Paris, Advisory Group for Aerospace Research and Development, Paris (France), p. 13-1 to 14-4, 1968. 21 refs. (Presented at the 14th Symposium of the Electromagnetic Wave Propagation Committee of the Avionics Panel of AGARD, Sandefjord, Norway, Aug. 19-23, 1968.)
CFSTI, DDC: AD 685665

Electromagnetic radiation undergoes modification while passing through the atmosphere because of absorption and scattering processes. In the case of scattering, light radiation is deflected from its original direction of propagation so that the amount of its total energy can be reproduced by measurements at so-called scattering angles. In the case of absorption, absorbent gases in the atmosphere convert radiant energy into heat in specific wavelength ranges. Although the aerosol concentration of the atmosphere is less than the gaseous phase by several powers of ten, aerosol particles play an important part in scattering processes. Rayleigh's law does not adequately explain the distribution of radiance in the sky because it neglects scattering by aerosol particles in the molecular atmosphere and higher scattering in the turbid atmosphere. Evaluation of polarization phenomena and scattering of radiation in fog must consider aerosol particles, even though mathematical

approximations for various types of aerosol particles and their scattering coefficients are not easily obtainable. The size distribution, structure, and refractive index of aerosols are surveyed.

16764

Breiland, John G.

VARIATIONS IN THE VERTICAL DISTRIBUTION OF ATMOSPHERIC OZONE DURING THE PASSAGE OF A SHORT WAVE IN THE WESTERLIES. J. Geophys. Res., 74(18):4501-4510, August 20, 1969. 3 refs.

Vertical distributions of ozone and of temperature taken from a series of balloon flights at Albuquerque, New Mexico approximately every 4 hrs over a 2!-day period during which a short-wave upper trough passed over the station are studied together with synoptic meteorological data. The analysis indicates that with the approach of the trough and the simultaneous lowering of the tropopause and a southeasternward displacement of the subtropical jet stream over the station, there is an increase influx of O3-rich polar stratospheric air over the station in the form of thin layers, which replaces O3-poor subtropical air. This results in a layer structure characterized by several maxima and minima in the vertical distribution of the thermal stability as indicated by the temperature soundings. The layer structure is most pronounced between the lower tropopause and the 20-km level. The large-scale features of the layer structure, especially with regard to O3, show a remarkable persistence from sounding to sounding throughout the entire period of observations, which indicates that the layers associated with the long-wave pressure system and the accompanying jet stream have a very large horizontal, or quasi-horizontal, extent. At the same time, variations in the vertical distribution of O3 with respect to time, observed as the short-wave trough is being displaced with respect to the station, indicate that within the layer structure, especially in, or near, a trough, there also may exist horizontal gradients of the partial pressure of O3 of considerable magnitude in the direction of the flow as well as in a transverse direction. (Author's Abstract)

16846

Mosher, J. C., W. G. MacBeth, M. J. Leonard, T. P. Mullins, and M. F. Brunelle

THE DISTRIBUTION OF CONTAMINANTS IN THE LOS ANGELES BASIN RESULTING FROM ATMOSPHERIC REACTIONS AND TRANSPORT. J. Air Pollution Control Assoc., 20(1):35-42, Jan. 1970. 11 refs.

Different techniques of data analysis have been successfully applied to Los Angeles County air monitoring data to delineate major source areas for carbon monoxide, sulfur dioxide, nitrogen oxides, and ozone; to develop contaminant transport patterns; and to demonstrate the progress of photochemical reactions in the

Los Angeles atmosphere. The heavily industrialized South Coastal, Southwest Coastal, and East San Fernando Valley areas are most affected by contaminants derived from fuel combustion at stationary sources. Emissions from mobile sources are heavily concentrated in some of the abcve source areas and also in the Central area. Seasonal variations in weather affect the total contaminant emissions as well as the distribution, transport, and ultimate fate of the individual contaminants. More frequent surface inversions in winter, combined with greater quantities of emitted contaminants, result in winter time atmospheric concentrations of primary contaminants (carbon monoxide, nitric oxide, sulfur dioxide, and particulates) more than twice as high as comparable summer time concentrations. Stronger on-shore breezes of longer duration transport contaminated air parcels farther across the County during summer. Longer, more effective irradiation and low persistent inversions result in higher ozone concentrations in summer. Air monitoring data confirm the photochemical formation of ozone during transport of air parcels along the most common "pathways" of transport--the prevailing wind flows from coast to inland areas. (Author's Abstract)

16889

Kuhn, William R., and Julius London

INFRARED RADIATIVE COOLING IN THE MIDDLE ATMOSPHERE (30-110 km). J. Atmospheric Sci., 26(2):189-204, March 1969. 50 refs.

The infrared contributions to the heat budget by the 15micron CO2, 9.6micron O3, and 80micron H2O bands are evaluated for the upper stratosphere, mesosphere, and lower thermosphere as a function of latitude for both summer and winter. Flux divergences are numerically evaluated for a quasi-random band model with the appropriate line-broadening mechanism. A general discussion of the source function applicable to a multi-vibrational level molecule is given, and this formulation is applied to the 15 micron band of carbon dioxide. The flux divergence of infrared radiation acts to cool the atmosphere in the 30-110 km height region except in the vicinity of the mesopause. Here there is a small, but nevertheless significant heating which increases in value toward the summer pole (approximately 4K per day). Centers of cooling appear near the stratopause for low latitudes (approximately 10K per day) and in the lower thermosphere over the winter pole. Thermospheric values may vary by a factor of 4 because of uncertainties in the collisional lifetime of the 15micron transition, parameters have been developed for the rates of temperature change in this region in terms of the collisional and the radiative rates. Ozone makes a significant contribution to the cooling in the vicinity of the stratopause (approximately 3K per day). The water vapor contribution is approximately 1K per day for a mixing ratio of 10 to the minus 6 gm/gm. Our calculations indicate that both these gases, when compared with carbon dioxide, give a negligible contribution to the flux divergence in the upper mesosphere. (Author's Abstract)

17034

Pressman, Jerome and Peter Warneck

THE STRATOSPHERE AS A CHEMICAL SINK FOR CARBON MONOXIDE. J. Atmospheric Sci., 27(1):155-163, Jan. 1970. 45 refs.

Stratospheric carbon monoxide removal is discussed and the significance of the stratosphere as a sink for CO is demonstrated. On the basis of two theoretical models, an attempt is made to determine whether the size of the sink is compatible with present knowledge of anthropogenic CO sources and available measurements of atmospheric CO concentrations over the past 20 years. The stratosphere provides a sink for CO due to the reaction OH + CO yields CO2 plus H. The radical CH is produced photochemically in a moist ozoneosphere with a time constant several orders of magnitude less than that of the CO oxidation reaction. As a result, almost all the CO entering the stratosphere is destroyed. The rate limiting factor is the transport of CO-rich air through the tropopause. Although the theoretical models provide several constraints for the rate of CO removal from the atmosphere, it is found that the uncertainties concerning measurements and source functions preclude the derivation of a reliable value for the total CO removal rate. An estimate indicates that the stratospheric sink contributes significantly, but only partially, to overall removal of CO from the atmosphere. (Author abstract modified)

17142

Littman, F. E., H. W. Ford, and N. Endow

FORMATION OF OZONE IN THE LOS ANGELES ATMOSPHERE. Ind. Eng. Chem., 48(9):1492-1947, Sept. 1956. 6 refs.

A discovery that oxidant could be formed experimentally by the irradiation of night air led to an investigation of the physical and chemical properties of the impurities (oxidant precursors) which form oxidant. That light was responsible for the formation was demonstrated by using two oxidant recorders, one indicating the oxygen concentration in untreated air and the other, the concentration in irradiated air. As determined by optical cut-off filters, the primary light acceptors absorbed from the short wave end of the visible spectrum to below 3600 Å. Spectrometric analyses of precursors caught in liquid-oxygen cooled dry ice traps showed that the bulk of the precursors comprised carbon dioxide and water, with the balance made up of organics. Nitrogen oxides were detected with a Griess reagent. The amount of nitrogen dioxide found suggested that some of it had formed during the collection and/or irradiation of the air sample. Further experiments established that nitric oxide is present in the air in quantities well in excess of those of nitrogen dioxide and that nitric oxide rapidly oxidizes to nitrogen dioxide in the presence of hydrocarbons: oxidation is accompanied by the formation of ozone. The quantitative aspects of ozone

formation by the photolysis of nitrogen dioxide are now under investigation.

17185

Oota, Yoshio

SMOG AND GROUND LAYER METEOROLOGY (I) - TO INVESTIGATE ON THE RELATION BETWEEN WEATHER PHENOMENA AND THE STATE OF AIR POLLUTION MAINLY IN TOKYO. (Sumoggu to kukan genshc (I) - Cmoni Tokyo niokeru kisho genshc tc csentaiyc no kankei o saguru). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(4):232-238, April 15, 1966.

Weather phenomena leading to the occurrence of smog in a polluted area are investigated by three types of approaches. The first deals with separate factors associated with weather phenomena in a given survey field. The second approach is concerned with an overall investigation of the behavior of atmospheric pressure as viewed from composite meteorological conditions. The third approach is a so-called vertical observation; it contrasts with the first and second approaches which can be defined as horizontal observations of weather phenomena. The first approach includes the analytic investigation of data which may show the interaction of air pollution with general weather condition, temperature inversion, wind velocity, and wind direction. A continuous curve graph of wind direction is used to exclude deflection errors due to the influence of atmospheric pressure movements. Dispersion formula are also included in the approach. In the second approach, a continuous curve graph of general weather phenomena which gives a clue to horizontal atmospheric movement is obtained. The relationship between fluctuations in atmospheric pressure and the continuous curve determines the precision of the graph. The general curve graph presents an evenly-curved line but is turned to show discontinuance of the line in the presence of interferences such as land and sea winds, frontogenesis, endemic atmospheric discontinuity, plus a line of geographical discontinuity. Results of the first two analytic procedures show that density of air pollution is closely related to atmospheric stability at many points and the rise and fall of temperature.

17197

Cota, Yoshio

SMOG AND GROUND LAYER METEOROLOGY (II). TO INVESTIGATE ON THE RELATION BETWEEN THE VERTICAL VARIATION OF TEMPERATURE AND THE CONCENTRATION OF AIR POLLUTION. (Sumoggu to kukan genshc (II) - Kion no suichoku henka tc csenncdc tonc kankei o saguru). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(5):306-312, May 15, 1966. 22 refs.

This study is part of a series on smog and ground layer meteorology. It discusses vertical daily variations in air pollution; the relationship between vertical temperature stability, and air pollution density during ground-layer atmospheric inversions; and variations in air-pollution density at the time of atmospheric layer transformation caused by a line of discontinuity. Vertical changes in temperature affect the hydrostatic stability of weather phenomena, and this alters the dispersion of pollutants and the lapse rate of pollution density. Extreme dispersion of atmospheric pollutants is observed at night, when vertical temperature inversions occur and when atmospheric turbulence at a relatively low ground layer causes enforced wind speed in the upper layer (about 10 m/s). Vertical rises in temperature coinciding with sunrise result in the gradual disappearance of temperature inversions, beginning in the lowest layer and progressing through to the stable layer. At this time, depending on the degree of heating, horizontal and vertical eddies can mix the lower layer with the upper layer. This heat convection which occurs first in the lowest layer, explains why the difference between wind speed in upper and lower layers decreases and why, after sunset, vertical temperature fall begins at ground layer and atmospheric inversion occurs again. Wind speed gradually declines at the same time, i.e., atmospheric pollutants do not descend from but rise to the upper layer.

17387

Glasson, William A. and Charles S. Tuesday

HYDROCARBON REACTIVITY AND THE KINETICS OF THE ATMOSPHERIC PHOTOOXIDATION OF NITRIC OXIDE. J. Air Pollution Control Assoc., 20(4):239-243, April 1970. 9 refs.

The reactivity in the atmospheric photooxidation of nitric oxide has recently been determined for a large number of hydrocarbons. To aid in the application of these hydrocarbon reactivity measurements, the kinetics of the atmospheric oxidation were studied. The hydrocarbons investigated covered a wide range of reactivities and structures and included 2,3-dimethyl-2-butene, 2-methyl-2-butene, 2-methyl-1-pentene, propylene, mesitylene, o-xylene, and n-hexane. The rate of nitric oxide photooxidation increased less than linearly with hydrocarbon concentration for all the hydrocarbons studied. The degree of nonlinearity varied, however, with hydrocarbon structure and reactivity. The effect of the nitric oxide and the nitrogen dioxide concentrations on the rate of nitric oxide photooxidation also depended on hydrocarbon structure and reactivity. For all the hydrocarbons studied, however, the nitric oxide photooxidation rate increased linearly with increased light intensity. The effect of complex hydrocarbon mixtures on the rate of nitric oxide photooxidation was investigated using three commercial gasolines. The photooxidation rates measured for these mixtures agreed within experimental error with calculated rates based on chromatographic analyses of the gasolines and the reactivity in nitric oxide photooxidation of the individual hydrocarbons in the gasolines. (Author abstract modified)

18010

Goldsmith, J. R.

LOS ANGELES SMOG. Science J., 5(3):44-49, March 1969.

The Los Angeles smog results from the reaction in the sunlit atmosphere of hydrocarbons and oxides of nitrogen, emitted mostly from automobiles. It differs from the dominant type of air pollution in the United Kingdom by occurring more in hot, dry weather than in cold, wet weather, being oxidizing rather than reducing, being related to motor vehicle exhaust rather than household heating. The components of Los Angeles smog and their sources are summarized. The atmospheric reactions of hydrocarbons and oxides of nitrogen in sunlight are discussed. Among the effects of photochemical smog are eye and respiratory irritation, vegetation damage, and reduced visibility.

18054

DeLuisi, J. J.

A STUDY OF THE EFFECT OF HAZE UPON UMKEHR MEASUREMENTS. Quart. J. Roy. Meteorol. Soc., 95(403):181-187, Jan. 1969. 13 refs.

The effect of atmospheric haze upon Umkehr observations is calculated in two ways. First, observed Umkehr curves are compared with computed Umkehr curves reconstructed from simultaneous direct soundings of the vertical ozone distribution. The difference between the two curves gives the 'experimental' haze effect. In the second method, Umkehr curves are computed for model atmospheres with and without haze the difference giving a 'theoretical' haze effect. When the two haze-effect curves are normalized to zero for a solar zenith angle of 60 degrees, both exhibit the same characteristics, viz., the 'correction' to be subtracted from an observed (with haze) curve is negative at all solar zenith angles, the correction reaches a maximum near 81 degrees, and there is a second small reversal near 87-88 degrees. Application of the derived haze corrections in the Umkehr evaluation procedure results in slightly higher O3 content at and just below the main maximum and slightly lower O3 content elsewhere. (Author's Summary)

D. MEASUREMENT METHODS

00051

J. S. Nader E. C. Tsivoglou (Co-Chairmen)

SYMPOSIUM - ENVIRONMENTAL MEASUREMENTS - VALID DATA AND LOGICAL INTERPRETATION. Public Health Service. Cincinnati, Ohio, Div. of Air Pollution and Div. of Water Supply and Pollution Control. July 1964. 332 pp.
GPO: 814-105-12, HEW: 999-AP-15

This collection of papers on air and water environmental measurements contains material pertaining to the data acquisition fields of air pollution. The systems operated by the Los Angeles County Air Pollution Control District and the U.S. Public Health Service (Continuous Air Monitoring Program) are reviewed. Other articles connected with air and air pollution information include those on data acquisition systems for fields of meteorology, physiology, and data interpretation.##

00059

R.A. Young

MEASUREMENT OF NITRIC OXIDE IN THE EARTH'S ATMOSPHERE (INTERIM REPT.). Stanford Research Inst., Menlo Park, Calif. Jan. 31, 1965, 32p.
CFSTI,DDC: AD 622371

The objectives of this investigation were to develop a testing facility capable of evaluating an NO measuring device, and to develop the components of the device to a degree adequate for D-region measurement. During the past year, a D-region simulator has been constructed for the purpose of testing both laboratory models and prototypes of the NO detector with special emphasis on the assessment of possible interference by excited states of O2, N2, and NO. Although only limited testing has been possible, the concept of selectively measuring NO by photoionization appears sound. The D-region simulator and current activities are described.##

00060

F.J. Woods, M.E. Umstead, J.E. Johnson

A STUDY OF THE IONIZATION PRODUCED BY THE CATALYTIC COMBUSTION OF HYDROCARBONS. NAVAL RESEARCH LAB., Washington, D.C. (NRL Rept. 6316.) Oct. 15, 1965. 15 pp.
CFSTI,DDC: AD 623014

Ionization produced during the catalytic combustion of hydrocarbons has been studied for its usefulness in applications such as chromatographic detection. When a Pt filament is heated above 500 C in an atmosphere containing the hydrocarbon, the formation of ions takes place during oxidation of the compound. The number of ions produced by the hydrocarbons is an exceedingly small fraction of the number of C atoms oxidized and varies widely depending upon the molecular structure of the hydrocarbon and the catalyst temperature. Branched hydrocarbons produce greater ionization than straight-chain compounds, although the ease of oxidation is opposite. H and CO burned in the combustion cell exhibit no ionization current, even when completely oxidized. Because of the marked effect of molecular structure on ionization and the response of the method to low concentrations of hydrocarbons in air, the procedure may find future use as a specific detector in gas chromatography. (Author)##

00068

M.W. Korth

DYNAMIC IRRADIATION CHAMBER TESTS OF AUTOMOTIVE EXHAUST. Public Health Service, Cincinnati, Ohio, Division of Air Pollution, PHS-999-AP-5. Nov. 1963, 59p.

A dynamic irradiation chamber facility was designed and built for investigations of irradiated auto exhaust under conditions of continuous mixing. The facility consists of a programmed chassis dynamometer, an exhaust dilution system, a dilution-air purification system, two irradiation chambers, and various exposure facilities. Three variables were considered in this first series of tests: (1) initial exhaust concentration (approximately 13 ppm carbon and 35 ppm carbon), (2) average irradiation time (85 and 120 minutes), and (3) fuel composition (14% and 23% olefins). The effects of varying these test parameters were determined by use of appropriate test criteria including NO2 formation rate, oxidant production, total hydrocarbon losses and reaction of specific species, aldehyde production, plant damage, and bacteria kill. Of the three variables studied, the exhaust concentration at the start of irradiation appeared to produce the most significant effects. Fuel composition had a lesser influence on some of the test criteria; very little difference was noted in the effects produced at the two average irradiation times. (Author)##

00092

M. Drexler M. Barchas

CHEMO-ELECTRICAL SENSING DEVICE. Airkem, Inc., New York City, June 1961, 142p.
CFSTI, DDC: AD 262502

This report describes an investigation of the feasibility of utilizing gas adsorption phenomena for the identification and quantitative determination of various gaseous materials. A discussion is presented of the factors influencing the performance of the various components of an experimental gas analyzer based on the measurement of characteristic adsorption energies. Reasons are given for the attempted use of this principle in such an instrument together with a theoretical discussion of the basis for concluding the instrument to be non-feasible in practice within the limitations of the original specifications. A review of material
obtained from available literature sources as well as
information resulting from experimental work is included in this report. (Author)##

00108

A. P. Altshuller

AIR POLLUTION - PART IV - ANALYSIS OF POLLUTANTS. CHAPTER 18 - ANALYSIS OF ORGANIC GASEOUS POLLUTANTS. Preprint. 1966.

The development of analytical procedures for organic gases and vapors has progressed rapidly in recent years. Almost all of these methods are available only as laboratory techniques and very few have yet been adapted for monitoring instruments. The need for total hydrocarbon or organic analysis became evident when it was realized that organic substances and particularly hydrocarbons were important reactants in the photochemical type of air pollution. Ideally, a hydrocarbon analyzer should show little or no response to the unreactive substances and high response to the reactive substances. No analyzer has been developed that can perform such analyses directly on emission or atmospheric samples; however, subtractive techniques can be used to remove olefins, aromatics, and aldehydes, and to determine these constituents by difference. Mass spectrometry, dispersive and nondispersive infrared instrumentation, and flame ionization analyzers have been applied to analysis for total organics in emissions or in polluted atmospheres. Since each technique entails a different response to various organic substances, considerable care is needed in interpreting and applying the results of such measurements.##

00122

D. L. Klosterman and J. E. Sigsby, Jr.

APPLICATION OF SUBTRACTIVE TECHNIQUES TO THE ANALYSIS OF AUTOMOTIVE EXHAUST. Environ. Sci. Technol. 1, 309-14 (Apr. 1967). (Presented before the Division of Water, Air, and Waste Chemistry, American Chemical Society, Atlantic City, N.J., Sept. 12-17, 1965.)

A simple system has been developed for chemical class analysis of hydrocarbons found in automotive exhaust. The technique should prove useful for evaluating the contributions of automotive emissions to photochemical air pollution. A system of scrubbers permits the sample to be analyzed for paraffins, olefins and acetylenes, and aromatics. Benzene may be determined with either the paraffinic or aromatic hydrocarbons. The system may be used with existing standard hydrocarbon analyzers without requiring their modification. (Author abstract)##

00124

C. H. Bachman, R. D. McDonald, and P. J. Lorenz

SOME PHYSIOLOGICAL EFFECTS OF MEASURED AIR IONS. (EXPERIMENT NO. 1 OF BIOLOGICAL ACTION OF IONIZED PARTICLES IN THE ATMOSPHERE.) Intern. J. Biometeorol. 9, (2) 127-139, July 1965.

An apparatus constructed for the generation and administration of measured air ion dosage is described. Experiments were performed on rats in which only the nostrils were exposed to the ionized air. Measurement of total ion current and of the electrical current to ground through the animal provided knowledge of the actual ion dosage. Initial experiments indicated that both positive and negative air ion treatments tended to stimulate heartbeat and respiratory frequencies. However the ion dosage per rat was subject to individual variability. (Author)##

00126

M. B. Pack and D. F. Adams

PROBLEMS OF RELATING ATMOSPHERIC ANALYSES TO EFFECTS OF AIR POLLUTION ON AGRICULTURE. J. Air Pollution Control Assoc. 16, (4) 219-24, Apr. 1966.

This presentation has emphasized the deficiencies of methods of atmospheric analysis and the inadequacy of present understanding of the relationship of air pollution to plant and animal injury. The purpose is to show where improved methods and further research are needed and perhaps to prompt more critical interpretation of atmospheric analysis data. The deficiencies mentioned are

generally recognized, but in the desire to obtain a rapid solution to a problem they are sometimes overlooked. This frequently adds to the confusion rather than helping to clarify the situation. Consideration has been limited to fluoride, photochemical air pollutants, and sulfur dioxide. (Author)##

00142

P. G. Hinners, J. K. Burkart, and G. L. Contner

ANIMAL EXPOSURE CHAMBERS IN AIR POLLUTION STUDIES. Preprint. 1966.

Recent developments in animal exposure chambers and their use in studying the biological effects of air pollution are described. The various atmospheres studied include irradiated and non-irradiated auto exhaust atmospheres, oxides of sulfur, and oxides of nitrogen. (Author)##

00144

G. B. Morgan, E. C. Tabor, C. Golden, and H. Clements

AUTOMATED LABORATORY PROCEDURES FOR THE ANALYSIS OF AIR POLLUTANTS. Preprint. 1966.

Automated methods are presented for the analysis of various components present in collected particulates, impinged gases and precipitation. Among these components are sulfates, nitrates, nitrites, ammonia, sulfur dioxide, chlorides and nitrogen dioxide. Adoption of automation has resulted in an increased precision for all of the aforementioned analyses. In addition, the productivity per man day is tripled to quadrupled over the corresponding manual procedures. Operational problems associated with the operation of the systems are discussed. (Author)##

00155

Sweeney, M. Patrick and Miles I. Brubacher

EXHAUST HYDROCARBONS MEASUREMENT FOR TUNEUP DIAGNOSIS? In: Vehicle Emissions, Part II, SAE Progress in Technology Series Vol. 12, New York, Society of Automotive Engineers, Inc., 1966, p. 307-316. 5 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

With an activated control program in California and its imminent prospect nationwide, recently attention has been focused on simplifying exhaust hydrocarbon measurement for potential use as a tuneup garage diagnostic tool. Work has been underway to evaluate new instrumentation and procedures for hydrocarbon measurement suitable for field use. It is concluded that: (1) With a

"one minute" cycle, measured emissions seem to correlate adequately with the California procedure; (2) There are prototype instruments which are inherently much less susceptible to environment of use; and (3) For engine diagnostic purposes, the principal uses of hydrocarbon measurements would be: (a) an initial check (almost any engine malfunction raises hydrocarbons, if low, engine does not need tuneup work); and (b) recheck after tuneup (an increase in hydrocarbons indicates a tuneup oversight or error, and the car would then be checked further). (Authors' abstract)##

00160

Campau, Robert M and James C. Meerman

CONTINUOUS MASS SPECTROMETRIC DETERMINATION OF NITRIC OXIDE IN AUTOMOTIVE EXHAUST. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, New York, Society of Automotive Engineers, Inc., 1966, p. 325-334. 11 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

Three techniques for the measurement of the oxides of nitrogen in automotive exhaust were evaluated. The techniques included a "nitrous fume" analyzer, a gaseous NO2 colorimeter, and a movable mass spectrometer. All data obtained were compared to data from currently accepted wet chemical methods, the phenoldisulfonic acid method and the "modified" Saltzman technique. Of the techniques evaluated, the mass spectrometer analysis of NO has been found to be the most useful for the study of nitrogen oxides in engine exhaust. The high cost of wet chemical analysis has indicated a need for an improved and continuous analytical method. Most analytical methods oxidize the NO present in exhaust gas to NO2 which is highly reactive with other exhaust constituents and even with the sampling systems. The mass spectrometer approach measures NO within seconds of its discharge, thus minimizing any reactions prior to measurement. Nitric oxide is monitored at the mass/charge ratio of 30, the molecular ion peak. Contributions to the m/e peak by other exhaust components such as formaldehyde and ethane are less than five percent under most engine operating conditions. For rich operation, a small correction was used for CO of molecular weight 30. The rapid response of the mass spectrometer allows monitoring of NO in automotive exhaust under transient conditions such as the California Motor Vehicle Pollution Control Board Exhaust Test Procedure. Typical MVPCB nitric oxide traces are shown with various carburetion and spark timing calibrations. (Authors' abstract)##

00164

STATISTICS ON PARTICULATE CONTAMINANTS - SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT (FIRST QUARTER 1966). San Diego Dept. of Public Health, Calif. Mar. 1966. 7 pp.

First Quarter 1966 Statistics on Particulate Contaminants San Diego County Air Pollution Control District are presented. Data are included on weight concentrations from high volume filter samples, soiling indexes, and hourly averages of gaseous contaminants.##

00179

Jutze, G. A., R. L. Harris, Jr., and M. Georgevich

THE INTERSTATE AIR POLLUTION SURVEILLANCE PROGRAM ("EFFECTS NETWORK"). J. Air Pollution Control Assoc. 17(5), 291-3 (May 1967). (Presented at 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-78).

Paper discusses the scope of the work to be done by the Abatement Branch, Division of Air Pollution, U.S. Public Health Service. Major effort of the Abatement Branch will be devoted to intensive field surveys conducted on a nationwide scale. Data will be accumulated on: dustfall, particulate identification of impinged materials, sulfation, corrosion, tarnishing of metals, and deterioration of textiles, dyes and rubber. Included is a table specifying the components to be examined, the measurement technique to be used, the length of exposure for the component, the units of contamination reported, and the effect demonstrated.##

00192

S. Hochheiser and W. F. Ludmann

FIELD COMPARISON OF METHODS OF DETERMINING ATMOSPHERIC NO AND NO2. Preprint. (Presented at the 150th National Meeting, American Chemical Society, Atlantic City, N.J., Sept. 13, 1965.)

Atmospheric samples from several cities were used in a comparison study of the Saltzman and Jacobs-Hochheiser methods for measuring NO2 concentrations in the atmosphere. NO is determined by these methods after wet oxidation of the NO to NO2 in a gas scrubber containing acid-permanganate reagent. The methods were compared using samples collected for 30 minutes and 24 hours. Adsorbing reagents used in the 24-hour sampling methods were modified to accomodate circumstances associated with longer sampling periods. The relationship between atmospheric NO and NO2 concentration and method of measurement is discussed. (Author)##

00196

J. S. Ferguson and E. G. Sheridan

SOME APPLICATIONS OF MICROSCOPY TO AIR POLLUTION. Preprint. J. Air Pollution Control Assoc. 16, (12) 669-72, Dec. 1966.

(Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-74.)

The microscope as it has been and is now applied to air pollution work is discussed. A summary of the most common particulate sampling equipment is presented and distinctions as to the area of usage (suspended, or settled particulates) are made in each instance. Actual cases are discussed in which the polarizing microscope was used to determine identities and sources of particulate pollutants. Particles from such sources as power plants, feed mills, and combustion sources are discussed and photomicrographs of known samples and unknown particles causing complaints are presented and compared as part of the discussion. Aero-allergens as contributors to pollution and their importance in community surveys are discussed. A detailed discussion of three allergen samplers is given.##

00214

T. R. Hauser and D. W. Bradley

THE SPECIFIC SPECTROPHOTOMETRIC DETERMINATION OF OZONE IN THE ATMOSPHERE USING 1,2-DI-(4-PYRIDYL)ETHYLENE. Anal. Chem. 38, 1529-32, Oct. 1966.

A new method for the sampling and analysis of ozone in the atmosphere is described. Atmospheric ozone is collected in a solution of 1,2-di-(4-pyridyl) ethylene in glacial acetic acid. The olllected ozone reacts with the 1,2-di(4-pyridyl) ethylene to form an ozonide that undergoes cleavage to yield pyridine-4-aldehyde for which a simple spectrophotometric determination was developed. The relationship between the micrograms of pyridine-4-aldehyde generated per microgram of ozone sampled has been determined, so that pyridine-4-aldehyde may be used for calibration. Various other oxidizing or reducing substances do not interfere with the method, at least not in the concentrations in which they are found in the atmosphere. The method offers good sensitivity, reproducibility, and excellent stability for delayed analysis after sampling. (Authors' abstract)##

00224

M. Shepherd, S. M. Rock, R. Howard, and J. Stormes

ISOLATION, IDENTIFICATION, AND ESTIMATION OF GASEOUS POLLUTANTS OF AIR. Anal. Chem. 23(10):1431-1440, Oct. 1951.

Previous attempts to concentrate air pollutants in a cold trap and analyze the concentrates by mass spectrometer have had disappointing results. A new method by which the air of Los Angeles County has been examined combines the isolation of gaseous pollutants on a filter at liquid oxygen temperatures, separation of the isolated frozen concentrate by isothermal

distillation or sublimation at low temperatures and pressures, and identification and estimation of distillates by the mass spectrometer. The method is capable of determining as little as 0.0001 ppm of some pollutants from a 100-liter sample of air; with larger samples, 0.000001 ppm of some substances can be determined. The gaseous phase of the Los Angeles smog was found to be of the order of 0.5 ppm of the air. About 60 chemcial compounds or families of compounds were identified or tentatively identified, and the amounts of some of these were determined. It was shown that the gaseous phase of the smog was primarily a mixture of hydrocarbons, and of hydrocarbons combined with O, N, and Cl. These hydrocarbons, principally the unsaturated ones, when oxidized with O3 and NO2 in the presence of UV light, produce substances which constitute a large proportion of the smog concentrates. These oxidation products cause eye and respiratory irritations such as are produced by the real smog, and smell like spectra of the smog concentrates may eventually indicate the presence of other irritants. The new method may be applied to special problems in air pollution over large areas or inside industrial plants. (Authors' abstract) ##

00237

E.R. Stephens E.F. Darley

ATMOSPHERIC ANALYSIS FOR PAN. Preprint. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Jan. 6-7, 1964.)

Some months ago a preliminary report was given on the application of electron capture detection to the gas chromatographic measurement of atmospheric peroxyacyl nitrates (PANs). A 3 ft x 1/8 in diameter glass column packed with 5% carbowax 400 on 100-200 mesh chromosorb W was operated at 35 C with 25 ml/minute of nitrogen carrier gas. The electron capture detector head was fitted into an aerograph. Injection of 2 ml gas samples containing pphm concentrations of PAN (peroxyacetyl nitrate) or PPN (peroxypropionyl nitrate) gave peaks at 2 min 10 sec and 2 min 45 sec, respectively. In consideration of the instrumental noise level it was estimated that concentrations of 0.3 to 0.5 pphm could have been measured. This is considerably smaller than that required to cause moderate plant damage and so, for the first time, it became possible to measure this series of compounds at the concentrations present even in low levels of photochemical air pollution. Several problems were encountered and not completely solved during the course of this work. Most of these had to do with the extreme instability of the PANs. Tow new instruments have now been put into operation in an attempt to improve the reliability of this analytical method. Since the electron capture detector is sensitive to organic nitrates it was of interest to try to measure these compounds. With air samples the oxygen peak overlaps the methyl nitrate making it impossible to measure this compound with a 9 in column. Some experiments were done with a 3 ft x 1/8 in teflon column. At 22 C and 30 ml N2 per minute the methyl nitrate emerged at 1 min. and 40 sec. Sensitivity is nearly the same as that for PAN. It is estimated that about 0.5 ppb would be detectable in atmospheric samples.##

00264

R. H. Wade, J. M. Ross and H. M. Benedict

A METHOD FOR THE DETECTION AND ISOLATION OF TRACES OF ORGANIC FLUORINE COMPOUNDS IN PLANTS. (FINAL REPT.) Stanford Research Inst., South Pasadena, Calif., Southern California Labs. Apr. 1963. 20 pp.

A method for the detection and isolation of submicrogram quantities of organic fluorine compounds from plant materials in the presence of much larger amounts of inorganic fluoride is presented. The procedure consists first of a rapid screening step for use with large numbers of vegetable samples and extracts and, second, of a chromatographic step to isolate and characterize any fluoro-organics found. These methods are developed in light of specific chemical characteristics of organic fluorine compounds as a general class. A modification of Soep's quantitative submicro fluoride analytical method is presented as applicable to these isolation methods. Microgram quantities of organic fluorine compounds were found in the plant materials investigated but at a level too low for isolation and identification. (Authors' abstract)##

00274

R. A. Hamilton and J. M. Walker

A METHOD OF MEASURING ATMOSPHERIC OZONE ABSORPTION COEFFICIENTS. J. Atmospheric Terrest. Phys., Vol. 28, 667-672, July 1966.

A method is described of determining the ozone absorption coefficients in the wavebands normally used when measurements are made of the amount of atmospheric ozone by a Dobson spectrophotometer. The ratio of absorption coefficients in different wavebands is obtained from the calculated amounts of ozone when simultaneous measurements are made with different wavebands. Values obtained from observations at Oxford and at Lerwick show good agreement: the values differ appreciably from those of Vigroux and other workers. (Authors' summary)##

00293

E. C. Tabor and G. V. Smith

NATURE OF THE BENZENE-SOLUBLE FRACTION OF AIR PARTICULATE MATTER. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-121.)

Annual composites of the benzene-soluble portion of air particulate matter were obtained from suspended particulate samples collected at 78 urban and 32 non-urban stations of the National Air Sampling Network. These samples of

benzene-soluble organics were separated into the following functional groups of organic compounds: water-soluble, acids, bases, aliphatic hydrocarbons, aromatic hydrocarbons, and oxy-neutral compounds. Tables are presented showing the composition of the individual samples and frequency distributions of percentage values for the different fractions. Results are discussed and suggestions made concerning causes of unusual results. Infrared absorption curves are presented to illustrate similarities and differences. (Authors' abstract) ##

00297

G. B. Morgan, C. Golden, and E. C. Tabor

NEW AND IMPROVED PROCEDURES FOR GAS SAMPLING AND ANALYSIS IN THE NATIONAL AIR SAMPLING NETWORK. J. Air Pollution Control Assoc., 17(5):300-304 (May 1967). (Presented at the Air Pollution Control Association Annual Meeting, June 20-24, 1966, San Francisco, Calif., Paper 66-114).

The NASN sampler for the collection of gaseous pollutants has been modified to increase its versatility and efficiency. Oxides of nitrogen are collected in bubblers employing a 70-100 microns frit with a collection efficiency of approximately 50% depending upon the frit porosity. Included in the sampler is a bubbler for the collection of aldehydes in which the aldehyde-MBTH complex is stable at least 2 weeks. This inert bubbler which is constructed of polypropylene and Teflon, makes it possible for samples to be collected over the network and analyzed at a central laboratory. In addition, gaseous ammonia is collected in 0.1 NH2SO4. This collecting system has an efficiency greater than 85%. Low level samples are analyzed automatically employing Nesslerization whereas high level samples from source emissions may be collected in indicating boric acid and titrated with 0.02 NH2SO4. The sampler will accomodate either 50 or 100 ml polypropylene. (Authors' abstract) ##

00328

H. Watanabe and T. Nakadoi

FLUOROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF ATMOSPHERIC OZONE. J. Air Pollution Control Assoc. 16, (11) 614-7. Nov. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966.)

This work has initiated in an effort to obtains better method for the manual determination of trace amounts of atmospheric ozone. The method described depends upon the fact that ozone oxidizes nonfluorescent 9,10-dihydroacridine to fluorescent acridine. When the ethyl alcohol solution of acridine is acidified by 6N acetic acid, the fluorescence maximum occurs approximately at 482 millimicrons and its intensity is sufficiently strong to be useful in this analysis. Linear relationships between acridine concentrations and fluorescence intensities were obtained from

0.1 to 3.5 micrograms per ml. by measurement with a commercial fluorophotometer. The results indicated that the low concentrations of experimentally prepared ozone measured by this method were in good agreement with those obtained by the phenolphthalin method. This method appeared to be about twice as sensitive as the phenolphthalin method but it is subject to some interference from nitrogen dioxide. (Authors' Abstract)##

00329

W. R. Parker and N. A. Huey

MULTIPURPOSE SEQUENTIAL SAMPLERS. Preprint. J. Air Pollution Control Assoc. 17, (6) 388-91, June 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-81.)

Presented is the design, construction, and field utilization of a sequential sampling system for the monitoring of gaseous pollutants capable of detection by "wet chemical" techniques. Also described are some specially designed midget impingers and bubblers. These impingers are practical for field utilization as well as for laboratory use. (Author)##

00336

G. Ozolins and R. Smith

A RAPID SURVEY TECHNIQUE FOR ESTIMATING COMMUNITY AIR POLLUTION EMISSIONS. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. Oct. 1966. 83 pp. (Presented at the 59th Annual Meeting of the Air Pollution Control Assoc., San Francisco, Calif., June 20-24, 1966, Paper No. 66-11.)

A technique has been developed for surveying pollutant emissions within a community or metropolitan area in 3 to 6 man-weeks. The methods for conducting such a survey are described in this paper. An important feature of this technique is the concept of reporting zones. The quantities of pollutants released can be assessed not only for the total community but also for different subdivisions of the area. The results are emission maps of a community depicting emission of pollutants in quantities per unit area. Seasonal variations in pollutant concentrations are considered, and emission rates of pollutants can be calculated for specified times of the year. The four major source categories considered are combustion of fuels in stationary and in mobile sources, combustion of refuse material, and industrial process losses. Each category is considered in detail relative to sources of information, seasonal variation in emissions, methods for estimating pollutant emissions by areas, and use of emission factors. Results obtained by application of this technique in two metropolitan areas are summarized. (Author)##

00348

T. P. Ramachandran

THE DETERMINATION OF NITRATE (A DISSERTATION) (DOCTOR'S THESIS). (For the degree of Doctor of Philosophy in the Dept. of Chemistry, Maharajas Coll.) 1966. 118 pp.

A simple, sensitive and specific method for the determination of nitrate in microgram ranges applicable for water and air samples is described. The method is directly applicable to water samples without recourse to evaporation or separation procedures. The proposed method was evolved as a result of the exhaustive study of the nitrate-chromotropic acid reaction in concentrated sulfuric medium. Nitrate reacts with chromotropic acid in about 75% v/v sulfuric acid medium giving a water-soluble yellow product. Spectrophotometric measurement of the absorbance of the color at 410 millimicrons provides a means for the determination of nitrate in the concentration range of 0.2 to 20 milligrams per liter. Many commonly occurring materials such as oxidizing agents, nitrite, chloride and iron (III) were found to interfere with the nitrate-chromotropic acid reaction. As a result of systematic studies of the nitrate-chromotropic acid system with respect to these interferences, a simple, direct procedure has been developed by which all the above mentioned interferences were either eliminated or masked. The method has been applied to the analysis of water and air samples. The proposed method is simpler, more rapid and more specific than any other existing method. (Author) ##

00381

W. L. Crider

HYDROGEN FLAME EMISSION SPECTROPHOTOMETRY IN MONITORING AIR FOR SO2 AND SULFURIC ACID AEROSOL. Anal. Chem. 37, 1770-3, Dec. 1965.

The principle of hydrogen flame emission spectrophotometry is demonstrated to be of practical use in monitoring the atmosphere of animal exposure chambers for SO2 in concentrations from 0.1 ppm (v./v.) to 100 ppm and for airborne droplets of H2SO4 in the concentration range from 0.17 to 5.2 mg per cu meter. Some parameters influencing emission intensity are explored. (Author) ##

00385

P. E. Saltzman and A. F. Wartburg, Jr.

A PRECISION FLOW DILUTION SYSTEM FOR STANDARD LOW CONCENTRATIONS OF NITROGEN DIOXIDE, Anal. Chem. 37, 1261-4, Sept. 1965.

Preparation of primary standard low concentrations of nitrogen dioxide was required to critically evaluate analytical procedures for this gas. A tank mixture of 0.4% nitrogen dioxide in air was metered by an asbestos plug flowmeter into a compact flow dilution system designed for minimum dead volume and back pressure. The mixture was monitored by a calibrated Mast oxidant analyzer. Les than 5 minutes sufficed to reach a steady concentration, which was maintained precisely for many hours. The tank mixture was analyzed gravimetrically by passage through two

Ascarite-Anhydrone U-tubes; the fraction of nitrogen dioxide not absorbed was negligible. A small correction to the gravimetric analysis was made for the carbon dioxide in the tank mixture, determined gas chromatographically. It was determined that no correction was necessary for water vapor, since its concentration in the tank mixture was very low. Preliminary studies were made of the stoichiometry of the nitrogen dioxide reaction with Griess-Saltzman reagent. Absorbances of the colors developed showed that one mole of gas was equivalent (within a few per cent) to 0.72 mole of standard nitrite solution Response was linear with concentrations computed from flowmeter readings and the tank analysis, and with sampling time for a fixed concentration. The apparatus and techniques should be applicable to many other gases. (Author)##

00386

E. Sawicki and J. D. Pfaff

QUENCHOPHOSPHORIMETRIC ANALYSIS FOR CONJUGATED COMPOUNDS.
Mikrochim. Acta (1-2) 322-33, 1966.

A new method of analysis that incorporates many of the reagents found useful in quenchofluorometry is introduced. Since many types of non-fluorescent and weakly fluorescent compounds can be analyzed, quenchophosphorimetry is a complementary tool. This method of analysis is superior to colorimetry and fluorometry in simplicity, sensitivity and selectivity for many types of compounds. Examples of this technique are given. One striking example is the determination of p-nitroaniline in the presence of carbazole, p-hydroxyacetophenone, triphenylamine and tri-phenylene all of which are usually intensely phosphorescent. New types of functional group analyses for individual compounds and families of compounds should be possible with quenchophosphorimetry. (Author)##

00387

Malanchuk, M.

A CONTINUOUS AUTOMATIC APPARATUS FOR DETERMINATION OF SULFUR DIOXIDE IN THE ATMOSPHERE OR IN COMPLEX GAS MIXTURES.
Preprint. 1965.

A colorimetric-type instrument was adapted for the continuous automatic measurement of sulfur dioxide by use of an iron(III)-phenanthroline absorption solution. Although it lacks the sensitivity and rapid response of conductimetric-type units, it shows specificity for sulfur dioxide in complex mixtures and gives an accurate determination that is not possible with the present conductimetric-type. AA##

00418

J.W. Happ, J.B. Harstad, I.M. Buchanan

EFFECT OF AIR IONS ON SUBMICRON T1 BACTERIOPHAGE AEROSOLS (TECHNICAL MANUSCRIPT 281). Army Biological Labs., Frederick, Md., Physical Defense Div. Feb. 1966. 18 pp.
DDC:AD 478388

The effect of a high concentration of ionized air molecules on sampling submicron T1 phage aerosols of a submicron particles size was evaluated by comparing the phage recoveries of all-glass impingers (AGI-4) and Type 6 filter papers. Sampler recoveries of all ionized aeroscls were less than the recoveries of non ionized control aerosols. These reductions in recovery were greater with positive ions than with negative ions or ions of mixed polarity. The AGI-4 allowed considerable slippage which was not affected by the air ions. Type 6 filter paper recoveries were less than AGI-4 RECOVERIES. #THE AIR IONS DID NOT appear to affect the aerosol particle size as determined by an lectron microscope. (Author abstract)##

00426

G. Lundeen and R. Livingston

CHEMILUMINESCENCE OF HYDROCARBON OXIDATION. Photochem. Photobiol. Vol. 4:1085-96, 1965.
CPSTI, DDC: AD 631111

That chemiluminescence accompanies autoxidations and decompositions of some peroxides has been known for some time. Recently mechanisms have beeen proposed to explain such chemiluminescence. This paper is a report of an experimental study of the luminescence which accompanies the autoxidation, spontaneous and induced by the decomposition of benzoyl peroxide, of tetralin and amyl benzene. Anthracene, 9,10-diphenyl anthracene and 9,10-dibromo-anthracene were used as intensifiers of luminescence.##

00435

R. I. Larsen

A METHOD FOR DETERMINING SOURCE REDUCTION REQUIRED TO MEET AIR QUALITY STANDARDS. J. Air Pollution Control Assoc. 11(2):71-76, Feb. 1961.

A computer program was written to calculate arithmetic and geometric correlation and regression between any two variables for various periods of time, location, and condition of solar radiation. Two thousand correlation coefficients and the associated regression lines of best fit were calculated to explore

the interrelationships between variables. The summary punched cards were the input to this computer program. The purpose of those analyses is to show the frequency of occurrence of various values of oxidant, eye irritation, and visibility; to indicate the equations relating these pollutant effects to concentration of carbon monoxide; and to show the usefulness of this information for predicting removal of precursor, as measured by carbon monoxide, necessary to obtain given levels of improved air quality.##

00469

G.D. Jaros, N.R. Parkin, J.G. Mingle, W.H. Paul

THE FATE OF OXIDES OF NITROGEN THROUGH A DIRECT FLAME AFTERBURNER IN THE EXHAUST OF A GASOLINE ENGINE. Preprint. (Presented at the Second Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Portland Oreg., Nov. 5-6, 1964, Paper No. 64-AP-10.)

This paper deals with a study which was made to determine the concentration of N oxides before and after a direct-flame afterburner connected to the exhaust of an internal-combustion engine. The scope of the work covered in this investigation is being confined to a single engine and one afterburner. The laboratory setup consisted of a 6-cylinder overhead camshaft engine direct-connected to an electric dynamometer. Steel flywheels mounted on the dynamometer shaft made possible the simulation of vehicle road operation during acceleration and deceleration. Operation of the engine was automatically controlled to the California sevenmode cycle. Analysis of NOx was accomplished by drawing exhaust gas samples every 2-1/2 sec during the 129 sec of the 7-mode cycly. NOx determinations were made by an instrument partially designed and totally built at Oregon State University. Other constituents of the exhaust gas (CO, CO2 and unburned hydrocarbons) were recorded with continuous, nondispersive infrared detectors. Polotted profiles of instantaneous NOx concentration during the 7-mode cycle time show results before and after the direct-flame afterburner for both rich and lean mixture operation.##

00476

P. C. Seagrave, H. H. Reamer, and B. H. Sage

OXIDES OF NITROGEN IN COMBUSTION: OSCILLATORY COMBUSTION AT ELEVATED PRESSURE. Combust. Flame 9(1):7-18, Mar. 1965.

Measurements of the local perturbations of pressure were made during the oscillatory combustion of mixtures of air and natural gas at elevated pressure under macroscopically steady conditions. The results indicate a complicated effect of the interrelation of mixture ratio and weight rate of flow upon the time-average pressure and the residual quantities of the oxides of nitrogen as well as upon the frequency and amplitude of the perturbations.

The results also reveal a complicated microscopic behaviour from both a physical and chemical standpoint at pressures in excess of twice that of the atmosphere. The thermal transfer to the walls of the combustor was a marked function of the nature of the pressure perturbations. The study was concerned with measurements of the perturbations of pressure during oscillatory combustion and with evaluation of the quantities of the oxides of nitrogen found in the exhaust of the combustor. The quantities of the oxides of nitrogen were determined in samples obtained by quenching the products of reaction by flow through a supersonic nozzle. Investigations were carried out at mixture ratios ranging from 0.65 to 1.5 stoichiometric.##

00489

P. W. West

INORGANIC MICROCHEMISTRY. Anal. Chem. Vol. 36:144R-50R, Apr. 1964.

The bulk of this review is devoted to classical microchemical methods. No distinction is made between microanalysis and trace analysis because the absolute quantity of material under study is of the same order of magnitude and the philosophies of approach are similar, even if the techniques involved may differ widely. To maintain proper perspective, appropriate comments will be included pertaining to specialized techniques such as atomic absorption spectrometry and coulostatic methods of analysis. For more critical evaluations of such techniques, the reader is referred to the accompanying reviews that deal in more detail with these methods.##

00550

J.N. Pitts, Jr., J.M. Vernon, J.K.S. Wan

A RAPID ACTINOMETER FOR PHOTOCHEMICAL AIR POLLUTION STUDIES. Intern J. Air Water Pollution, Vol. 9:595-600, 1965. (Presented at the Seventh Conference on Methods in Air Pollution Studies, California State Dept. of Public Health, Los Angeles, Calif., Jan. 25-26, 1965.)

The o-nitrobenzaldehyde actinometer, when used in photochemical air pollution studies, has some unique advantages. First, the actinometer could be used in a solid, solution, vapor or a colloidal dispersion system. Second, the absorption spectrum of o-nitrobenzaldehyde has an absorption onset at about 4000 Angstrom units which coincides with the wavelength threshold for the photodissociation of NO2 into NO and O atom. Since sunlight received on the earth's surface contains negligible radiation shorter than 3000 Angstrom units, the solar radiation which causes photochemical reactions involving NO2 as the primary absorbing molecule is in the 4000-3000 Angstrom unit region. While most of the established chemical actinometers are sensitive to wavelength variations, the quantum yield of the rearrangement of o-nitrobenzaldehyde to

o-nitrosobenzoic acid is found to be indepdent of wavelength in the region 4000-3000 Angstrom units. Thus, relative intensities of the "active" sunlight fraction can be easily measured by the relative amounts of o-nitrosobenzoic acid formed upon irradiation without resorting to the use of filters, monochromatic device or integrating process.##

00578

K. T. Whitby and C. M. Peterson

ELECTRICAL NEUTRALIZATION AND PARTICLE SIZE MEASUREMENT OF DYE AEROSOLS. I.E.C. Fundamentals, Vol. 4:66-72, Feb. 1965.

Data are presented on the magnitude of the natural charge on aerosol particles formed by the evaporation of atomized solutions of dye and on the residual charge after neutralization by mixing with a bipolar ironic atmosphere. Measured values of the charge after neutralization are compared with those predicted by assuming a Boltzmann distribution of the energy states in the mixture of ions and particles. The importance of this residual charge to such aerosol applications as filter testing and particle classification is discussed. Under certain conditions a size representative fraction of the dye particles smaller than 0.2 micron may carry a unit charge. Two mobility analysis techniques for measuring the particle size distribution of such aerosols are described and the results compared with electron microscope data. (Authors' abstract)##

CC610

A. P. Altshuller

ATMOSPHERIC ANALYSIS BY GAS CHROMATOGRAPHY. Preprint. 1966.

A number of the gas chromatographic procedures developed for atmospheric analysis have received little application. Several investigators have done atmospheric analysis for hydrocarbons and peroxyacetyl nitrate directly without concentration. Monitoring gas chromatographs could be built for obtaining large quantities of atmospheric analyses. Such equipment has not yet been fabricated. A related problem is the read-out of the large number of peaks or areas generated by making analyses every 10, 15 or 30 min. for 24 hrs. a day. Integration equipment capable of handling such outputs is available; such equipment is already in routine use in measuring hydrocarbons in auto exhaust studies. The application of the electron capture detector to analysis of low-molecular-weight halogenated substances, pesticides, and tracer materials in air has been demonstrated. The capability to measure such substance sby gas chromatography is excellent. Many future applications in atmospheric chemistry should make use of such procedures. (Author abstract)##

00620

W.D. Conner J.S. Nader

AIR SAMPLING WITH PLASTIC BAGS. Am. Ind. Hyg. Assoc. J. Vol. 25:291-297, June, 1964.

An inexpensive sampler has been developed whereby air samples can be collected in plastic bags without pump contamination and shipped to a laboratory for analysis. Data are presented to illustrate how well these bags contain (1) sulfur dioxide, nitrogen dioxide, and ozone in samples collected from synthetically prepared mixtures, and (2) hydrocarbons in samples collected from an auto exhaust irradiation chamber. The inorganic samples are in the concentration range of 0.5 to 1.5 ppm, and the hydrocarbon samples were in the concentration range of 7 to 20 ppm. The samples were stored for periods of several days. (Author abstract)##

00627

L. H. Weinstein, R. F. Bozarth, C. A. Porter, P. H. Mandl, and P. G. Tweedy

AUTOMATED ANALYSIS OF PHOSPHORUS CONTAINING COMPOUNDS IN BIOLOGICAL MATERIALS. I. A QUANTITATIVE PROCEDURE. Contrib. Boyce Thompson Inst. Vol. 22(7):389-398, Sept. 1964.

The Technicon AutoAnalyzer has been used to develop an automated method of phosphorus analysis for individual samples or for effluents from ion exchange columns. The sample or column effluent containing organically bound phosphorus is pumped, along with sulfuric acid, into the hot revolving glass helix of the Digestor unit. As the digest reaches the end of the helix, it is pulled off continuously into an impinger. A continuous sample is removed from the impinger, diluted with water, and reacted with molybdate reagent and 1-amino-2-naphthol-4-sulfonic acid reagent. The reaction mixture then passes through a heating bath at 95 C. where color development takes place. Upon emerging from the water bath, the mixture enters the flow cell (8 mm. light path) of a colorimeter. The absorbence of the solution at 810 millimicron is detected and the signal is transmitted to a recorder. Results with 23 compounds show that the method yields quantitative recovery of organically bound phosphorus. Analyses of the RNA composition of replicate samples of Perfection pea pod tissues show the standard error by the automated method to be considerably lower than that obtained by ultraviolet spectroscopy. (Author summary)##

00635

S. Hochheiser, M. Storlazzi, and W. J. Basbagill

USE OF A MOBILE LABORATORY IN AIR POLLUTION STUDIES. Am. Ind. Hyg. Assoc. J. 26, 77-83, Feb. 1965.

Since late 1962, the Division of Air Pollution of the U.S. Public Health Service has used a mobile air sampling laboratory to provide technical assistance and training to local air pollution agencies. The laboratory and the manual and instrumental methods used to measure SO2, NO, NO2, CO, CO2, total hydrocarbons, oxidants, aldehydes, soiling index, and total suspended particulates are described, as are data handling systems. In several cities various parallel sampling methods have been used to determine the effect of analytical methods on indicated concentrations of particular pollutants. The significance of the air quality data collected is discussed. (Author abstract) ##

00728

S.S. Epstein K. Bush

A SIMPLE PHOTODYNAMIC ASSAY FOR POLYCYCLIC ATMOSPHERIC POLLUTANTS. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-111.)

The photodynamic bioassay employed in this study is simple, rapid, and reproducible. However, the significance of data acquired with this technique is, at present, not easy to interpret. It appears that the assay provides an in vivo measure of the concentration of photosensitizing compounds in atmospheric particulates, and yields results which discriminate between pollutant fractions from the same source, and between pollutants from different sources. Whether these differences would be paralleled in non-composite samples cannot be assessed at present. The inter-source variations cannot be accounted for merely by a concomitant difference in the concentration of atmospheric particulates. Although there appears to be a general association between the BaP concentration and photodynamic potency of benzene-soluble extracts, the chemical data are, at present, too restricted for more meaningful correlations. Apart from this, while the presence of BaP may account for the major part of the potency of benzene-soluble and aromatic fractions, it obviously does not account for photodynamic potency in oxy-neutral or basic fractions. Both these fractions are frequently very potent and while largely chemically undefined, are devoid of BaP. The presumptive isolation of carcinogenic alkylated benz(c)acridines from basic fractions probably accounts for their occasional high potency and should serve to direct biological attention to this small but, hitherto, largely ignored fraction. (Author's summary modified) ##

00760

W.W. Heck

THE USE OF PLANTS AS INDICATORS OF AIR POLLUTION. Intern. J. Air Water Pollution (London), Vol. 10, 99-111, Feb. 1966. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 21-25, 1964.)

Plants have been extensively used in monitoring programs and as indicators of air pollution. Their usefulness in this capacity is based primarily on the sensitivity of selected plant species or varieties, or both, for specific air pollutants. This paper discusses the use of native plants as indicators of natural pollution in field studies and the use of specific plants grown under standard conditions to monitor natural levels of pollution, to identify phytotoxicants produced under controlled conditions, and to determine the sensitivity of plants to specific phytotoxicants as conditioned by various environmental factors. While various subjective injury indices have been used, no uniform system has been applied. The need for a unified index is discussed. (Author's abstract)##

00771

J.F. Roesler

PRELIMINARY STUDY OF CHARACTERISTICS OF PHOTOIONIZATION DETECTOR FOR GAS CHROMATOGRAPHY. Anal. Chem., Vol. 36, 1900-1903, Sept. 1964. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Pa., Mar. 1964.)

A photoionization detector was constructed utilizing Kovar metal seals. The glow current was regulated achieving a noise level on the order of 70 micromicroampere. The effects of carrier gas and argon flow rate were observed. Nitrogen and hydrogen were the primary carrier gases used. An extra electrode was incorporated into the detector in an effort to control the standing current. Polarities with respect to the glow discharge were important, affecting the sensitivity and linearity. Thermal effects of the glow discharge were also investigated. A 4.9-cc. sample of 2.8 p.p.m. propane in nitrogen gave a maximum response of 660 microamicroampere. (Author's abstract)##

00822

L.C. Brown D. Williams

INVESTIGATION OF ATMOSPHERIC IMPURITIES (FINAL REPT.) Ohio State Univ. Research Foundation, Columbus, (Nov. 1963.)
47 pp.
DDC: AD 426291

The usefulness of an electron spin resonance (ESR) spectrometer in the detection of small quantities of airborne biological impurities was investigated. The ESR spectrometer is being used to study electron spin resonance in biological materials, free radicals and other paramagnetic substances. A large number of irradiated amino acids, nucleic acids, peptides and simpler proteins are studied; characteristic patterns are observed for various compounds. Electron spin resonance spectra are observed in dried bacteria prior to irradiation. The resonances appear to stem from two sources: (1) transition metal ions, such as iron and manganese, usually producing a very

broad, strong resonance; and (2) a free radical producing a much narrower resonance. In many bacteria the two types of resonances are superimposed. The free radical resonance has been observed to increase in strength with the passage of time and appears to be correlated with the decrease in viability of the dried bacteria. The nature and strength of the resonances depend on the method of drying and on the method of storage after drying. The ESR spectra of particles filtered from the atmosphere both indoor and outdoor are observed. Particle sizes greater than 3 microns give rise to a broad, intense ESR absorption line. Atmospheric particles in the range of 0.8 micron to 3 microns diameter do not have an ESR line. Weak free radical lines are observed with particles of diameter from 0.22 micron to 0.8 micron. It is almost impossible to give valid estiamtes of the sensitivity of ESR techniques in the detection process.##

00845

SELECTED METHODS FOR THE MEASUREMENT OF AIR POLLUTANTS. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. May 1965. 53 pp.
GPO: 820-519, HEW: 999-AP-11

This manual is an effort to assist in the development of uniform standard methods of analysis of air pollutants. It makes available the judgment and knowledge of a large group of chemists in the Public Health Service. Methods of determining pollutants of common interest are presented in uniform format by chemists on the staff of the Division of Air Pollution. The methods were critically reviewed by the Interbranch Chemical Advisory Committee, which is composed of representatives of the professional chemical groups in all branches of the Division. Methods presented are as follows: For determination of sulfur dioxide, the West and Gaeke and the hydrogen peroxide methods; for determination of nitrogen dioxide and nitric oxide, the Saltzman method; for determination of oxidants, the neutral buffered-potassium iodide and the alkaline potassium iodide methods; for determination of aliphatic aldehydes, the 3-methyl-2 benzothiazolone hydrazone hydrochloride method; for determination of acrolein, the 4-hexylresorcinol method; for determination of formaldehyde, the chromotropic acid method; for determination of sulfate in atmospheric suspended particulates, the turbidimetric barium sulfate method; and for determination of nitrate in atmospheric suspended particulates, the 2,4 xylenol method. (Author abstract)##

00855

F.L. Ludwig, D.N. Coulson, E. Robinson

SIZE DETERMINATION OF ATMOSPHERIC SULFATE AND CHLORIDE PARTICULATES (FINAL REPT.). Stanford Research Inst., Menlo Park, Calif. Feb. 1966. 77 pp.

The sulfate aerosol sampling program for 1964 and 1965 has provided a total of 74 size distributions using the aerosol

spectrometer technique developed for this program. A typical size distribution for these data has a mass mean diameter of about 0.35 micron, a lower quartile of about 0.1 micron, and an upper quartile at about 1.0 micron. However, as is to be expected, the individual tests show a considerable degree of variation about these figures. The size distributions reflected changes in humidity, time of sample collection, and sampling location. When size distributions were grouped and averaged according to the prevailing relative humidity for the test, there was a definite tendency for larger sizes to accompany higher humidities. Chloride size distributions are available from a total of 36 tests, all run during the 1965 season. These data indicate an average size distribution with a mass median equivalent diameter of about 0.3 micron, a lower quartile of 0.15 micron, and upper quartile greater than 1.5 micron. This average size distribution is bimodal. The distribution mode at smaller sizes is similar to sizes of lead aerosols reported by Robinson and Ludwig (1964), while the mode at larger sizes is in the range reported by Junge (1963) for a typical continental aerosol. Since automobile exhausts are believed to contain aerosols composed of complex salts of lead, chlorine, bromine, and oxygen, a similarity between lead and chloride aerosols is not surprising. Further studies of these two materials might provide an interesting insight into urban aerosol interactions and sources. Analytical methods used for micro-sulfur determinations were improved in various ways as the program developed and more experience was obtained in its operation. One of the more important changes involved thermostating the titration cell, which improved baseline stabilization. Another change in technique provided for the evaporation of the sample in a stream of clean heated nitrogen instead of in the open laboratory atmosphere. Both of these changes improved the reliability of the sulfur determinations.##

00856

E.L. Kothny P.K. Mueller

FASTER ANALYSES OF NITROGEN DIOXIDE WITH CONTINUOUS AIR ANALYZERS. California Dept. of Public Health, Berkeley, Division of Labs. (AIHL Rept. No. 22 - Revised Edition) (Original paper presented at the 20th Annual Instrument Society of America Conference, Los Angeles, Calif., Oct. 4-7, 1965.) Jan. 1966. 27 pp.

A study concerning the effect of chemical and physical variables on the response of a nitrite reagent is described. For performance comparison, an empirical parameter was developed and applied. Optimization rules were derived and applied. A sub-minute response reagent was developed containing N,N(1-naphthyl, acetyl) ethylene diamine, 2-amino-p-benzenedisulfonic acid. Designs of gas-liquid contact and optical systems were evaluated to match fast response reagents. (Author abstract)##

00860

K.T. Whitby W.E. Clark

GENERATION AND DECAY OF SMALL IONS. SECTION II: ELECTRIC AEROSOL PARTICLE COUNTING AND SIZE DISTRIBUTION MEASURING SYSTEM FOR THE 0.015 TO 1 MICRON SIZE RANGE. Minneapolis, Dept. of Mechanical Engineering (Particle Lab. Publication No. 95). June 1, 1966. 57 pp.

An electrical particle counter and size analyzer system having the following characteristics has been described: (1) Sizing rnage from 0.015 to 1.2 micron. (2) Classification range from 0.015 to 0.6 micron at 28 1/m aerosol sampling rate. (3) A unique unipolar diffusion charger that is stable, controllable and capable of near optimum charging performance. (4) A versatile mobility analyzer capable of discrete classification of particles with mobilities from 0.01 to 0.0002 (cm/sec) /(v/cm) at aerosol flow rates up to 57 1/m. This analyzer is unique in using a filter located at the aft end of the current collector. This separation of the collecting electrode and the current collector permits the use of collector voltages up to KV while maintaining background currents below 10 to the minus fourteenth power amp. (5) Although the instrument described here is only semi-automatic, a completely automatic version of the EPC is entirely practical. An automatic EPC used together with an automatic CN and optical counter would permit continuous automatic size distribution measurement over the size range from 0.01 to 10 micron. (Author summary) ##

00864

B.Y.H. Liu, K.T. Whitby, H.H.S. Yu

GENERATION AND DECAY OF SMALL IONS. SECTION VI: EVALUATION OF A NEW ELECTROSTATIC AEROSOL SAMPLER SUITABLE FOR LIGHT AND ELECTRON MICROSCOPY (PROGRESS REPT.). Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering. (Particle Lab. Publication No. 95.) June 1, 1966. 31 pp.

The objective of the design is to construct an aerosol sampler which ideally should: a) sample an aerosol and deposit it uniformly over a relatively large surface area; b) be suitable for sampling aerosols onto any type of flat collecting surface including the ordinary glass microscope slide and electron microscope grids; and, c) be quantitative so that the absolute particle concentration of the aerosol can be determined. It was found that approximately all the losses occurred in the ions in the charging region. Attempts to reduce this space charge loss of aerosols by various arrangements were unsuccessful. Notwithstanding this nonideal behavior of the sampler, the sampler is still capable of collecting samples of aerosols to provide quantitative data on the absolute concentration of the aerosol particles and their size distribution when the data are corrected using the fractional efficiency curves. With a moderate

amount of extrapolation of the curve, it appears that the sampler can be used to obtain quantitative data over a size range from 0.01 to 5 micron particle diameter.##

00866

B.E. Saltzman A.F. Wartburg, Jr.

ABSORPTION TUBE FOR REMOVAL OF INTERFERING SULFUR DIOXIDE IN ANALYSIS OF ATMOSPHERIC OXIDANT. Anal. Chem. Vol. 37:779-782 May 1965. (Presented before the Division of Water and Waste Chemistry, 145th Meeting, American Chemical Society, New York City, Sept. 13, 1963.)

Sulfur dioxide is a serious negative interference in the iodometric determination of atmospheric oxidant by manual and instrumental methods. In many areas the quantities of sulfur dioxide present exceed those of oxidant and thus a false zero analysis may be obtained. Various liquid and solid scrubbing chemicals were investigated for selective removal of sulfur dioxide from an air sample stream; although this was easily done, avoiding concurrent loss of oxidant was more difficult. The deterioration of the scrubbing materials with use also was studied. An absorbent was developed consisting of glass-fiber paper impregnated with chromium trioxide and sulfuric acid. An absorber packed with this completely removed as high as 15 p.p.m. of sulfur dioxide without loss of oxidant. Such absorbers have been used on monitoring instruments and have exhibited useful lifetimes of two weeks of continous operation. Interesting new information on oxidant pollutants is being obrained. (Author abstract)##

00868

E. Sawicki J.D. Pfaff

ANALYSIS FOR AROMATIC COMPOUNDS ON PAPER AND THIN-LAYER CHROMATOGRAMS BY SPECTROPHOTOPHOSPHORIMETRY, APPLICATION TO AIR POLLUTION. Anal. Chim. Acta Vol. 32:521-543, June 1965.

A new technique is introduced in spectrophosphorimetric analysis by means of which spectra can be obtained directly on an adsorbent after chromatography. With this procedure spectra of the phosphorescent compound, its salts, its reduced or oxidized forms, or its derivatives can be obtained in all types of solvents. A large number of examples of this simple technique are given; detection limits range from 0.1 nanogram to microgram amounts. A new system for the circular paper chromatographic separation of aza heterocyclic hydrocarbons using aqueous formamide is described. Many of these heterocyclic compounds can be separated from each other as can the parent compounds from their alkyl drivatives. Air pollution mixtures separated by column and paper chromatography are analyzed with the phosphorimetric technique. Spots obtained on the

paper chromatograms are analyzed directly in the phosphorimeter. With these techniques benzo(f)quinoline, benzo(h)quinoline, benz(a)acridine, benz(c)acridine, and hydrocarbons such as phenanthrene and benzo(e)pyrene are radily characterized. (Author summary)##

00872

C. Xintaras, B.L. Johnson, C.E. Ulrich

THE APPLICATION OF THE EVOKED RESPONSE TECHNIQUE IN AIR POLLUTION TOXICOLOGY. Toxicol. Appl. Pharmacol 8(1):77-87, Jan. 1966. (Presented at the Society of Toxicology, Williamsburg, Va., Mar. 9, 1965.)

The evoked response to flash in the specific visual cortex and in the superior colliculus of unrestrained and unanesthetized albino rats bearing indwelling bipolar electrodes was investigated with the use of an on-line digital computer. It was anticipated that this method might provide a useful technique that might not only be more sensitive and reliable than morphological and biochemical methods, but also might provide some insight into the site of action of toxic agents on the central nervous system. For additional information the behavioral response of pressing a lever for food reinforcement was observed simultaneously. The effect of exposure to carbon monoxide as recorded by the technique of the evoked response was similar to that of exposure to pentobarbital. The response to respiratory exposure to ozone differed from that induced by carbon monoxide and pentobarbital. It was concluded that the technique of the evoked response could be a helpful tool in air pollution toxicology. The results are reproducible and the method shows great sensitivity. Data can be accumulated in a reasonably short time, especially if animals with indwelling electrodes are maintained continuously in the laboratory. (Author summary)##

00886

J. McK. Ellison

THE NATURE OF AIR POLLUTION AND THE METHODS AVAILABLE FOR MEASURING IT. Bull. World Health Organ. (Geneva), 32(3):399-409, 1965.

At present the principal sources of energy in Europe are coal and oil and fuels derived from them, and in European towns air pollution consists mainly of their combustion products. These combustion products naturally divide into two categories, gaseous and particulate, which are very different chemically and which behave very differently when they are near collecting surfaces; they therefore require very different techniques both for collecting and for estimating samples. Some methods of measurement, suitable for everyday routine use in Europe, are described; these

offer a compromise between completeness and economy, and can help to give a general outline of the air pollution situation without undue complexity or prohibitive cost. (Author's summary)##

00942

D. F. Adams

IMPROVED SULFUR-REACTING MICROCOULOMETRIC CELL FOR GAS CHROMATOGRAPHY. Anal. Chem., 38(8)1094-1096, July 1966. (Presented at the Air Pollution Symposium, 150th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1965.)

Because of the differences in electron requirements for oxidation of H2S, SO2, mercaptans, and organic sulfides and disulfides, it is necessary to standardize the titration cell against each type of compound or calculate the electron equivalents for each oxidation reaction for quantitative gas chromatographic analysis. To increase the sulfur specificity and to eliminate the need for individual compound calibration, the column effluents may be either oxidized to SO2 or reduced to H2S in a suitable furnace prior to introduction into the microcoulometric titration cell to obtain an equivalent response for an equivalent number of sulfur atoms. The furnace oxidation prior to titration should also destroy any olefinic compounds which might be present in complex gas mixtures, be titrated by bromine, and be erroneously reported as sulfur. Reduction to H2S rather than oxidation to SO2 has the added advantage of providing a four-fold increase in sensitivity because of the greater electron change required for the bromine oxidation of H2S. Although the need for individual calibration for each compound favors the use of a furnace between the chromatography column and the detector, it complicates the analytical system and thus may not be suitable for process control analysis under mill conditions. (Author summary)##

00956

P. K. Mueller, E. L. Kothny, M. O. Fansah, and Y. Tokiwa

DESIGN OF AZO-DYE REAGENTS FOR NITROGEN DIOXIDE ANALYSES. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-112.)

Azo dye reagents are used for the spectrophotometric analysis of nitrogen dioxide in air. The performance of these reagents depends upon the molecular structure, pH, ionic activity, and relative concentration of the components. These factors can be tailored to meet the practical requirements of different applications. In current practice the most frequently used azo-dye reagent in continuous analyzers is a formulation containing 5.0% acetic acid, 0.005% N(1-naphthyl)ethylene-diamine

dihydrochloride and 0.5% sulfanilic acid in water (modified Saltzman reagent). When using large volumes (liters) of reagent the acetic acid becomes both a hygienic and corrosion nuisance. The design factors for formulating azo-dye reagents were applied to the development of a nuisance free reagent with analogous performance. Several promising reagents were evaluated including tests for stability to light and air oxidation. The performance of new reagents was tested in a continuous air analyzer using nitrogen dioxide streams together with sulfur dioxide, ozone and nitric oxide as possible interferences. A new reagent system is recommended for use in currently operating nitrogen dioxide analyzers. (Author abstract)##

00966

S. S. Epstein

TWO SENSITIVE TESTS FOR CARCINOGENS IN THE AIR. J. Air Pollution Control Assoc. 16, (10)545-6, Oct. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-19.)

This report describes briefly 2 new bioassays, the photodynamic and mouse neonate, which have been developed recently as indirect and direct measures, respectively, of the carcinogenicity of organic atmospheric pollutants. The photodynamic assay measures concentrations of photosensitizing polycyclic compounds in organic extracts of atmospheric particulates, and reflects the ability of these compounds to sensitize cells to the otherwise non-toxic effects of long-wave ultraviolet light. The relevance of this assay to carcinogenicity depends on the previous demonstration, in a large series of polycyclic compounds of a strong positive association between photodynamic toxicity, using the motile ciliate Paramecium caudatum, and carcinogenicity attributable to polycyclic compounds. The use of neonatal animals for the carcinogenicity testing of pure chemicals is well documented. Neonates have been shown to be highly sensitive to defined carcinogens, administration of which in very low concentrations, in general, results in high tumor yields with relatively short latency periods. The present studies, although primarily methodological, established the high sensitivity of neonatal mice to carcinogens extracted from air.##

00977

R.S. Yunghans W.A. Munroe

CONTINUOUS MONITORING OF AMBIENT ATMOSPHERES WITH THE TECHNICON AUTOANALYZER. In: Automation in Analytical Chemistry, 6pp. (Presented at the Technicon Symposium, "Automation in Analytical Chemistry," New York City, Sept. 8, 1965.)

A variety of air contaminants can be monitored continuously with Auto/Analyzers. Instrument sensitivity, precision, and response time are more than adequate. The basic modules are all interchangeable, the instrument does not become obsolete as chemical procedures change or are modified, new approaches can be programmed easily, and the equipment is useful in methods research. In addition, automatic baseline programing and restandardization are decidedly advantageous as is the capability for introducing liquid calibration standards at any time.##

01021

B. E. Saltzman and A. L. Mendenhall, Jr.

DESIGN PARAMETERS AND PERFORMANCE OF A MINIATURIZED COLORIMETRIC RECORDING AIR ANALYZER. Anal. Chem. Vol. 36(7):1300-1304, June 1964. (Presented at Division of Water and Waste Chemistry, 145th Meeting, American Chemical Society, New York City, Sept. 12, 1963 and at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

Design parameters were studied in a prototype model of an improved recording air analyzer. Nitrogen dioxide was absorbed efficiently in a microcolumn packed with 20- to 60-mesh crushed glass in an improved absorbing reagent, which flowed through a rugged spectrophotometer employing a stainless steel cell (with glass windows) and stainless steel tubing connections. The system was designed for minimal liquid holdup to achieve rapid response with small liquid reagent flows. The improved electronic circuit provided a very stable output with only infrequent checks of the 0 to 100% transmittance points. A 90% response time of 3 minutes was achieved. For fluctuating gas concentrations with a period as short as 2 minutes, 62% of the full response amplitude was obtained. The results indicate the success of the rugged miniaturized design. (Author abstract)##

01033

R. E. Lee, Jr. and J. Wagman

A SAMPLING ANOMALY IN THE DETERMINATION OF ATMOSPHERIC SULFATE CONCENTRATION. Am. Ind. Hyg. Assoc. J. Vol. 27:266-71, June 1966.

Average particulate sulfate concentrations in air as measured from serial short-term samples collected on glass-fiber filters were consistently and significantly higher than those from single long-term samples. In investigating this anomaly, we found that significant amounts of extraneous sulfate can be formed on glass-fiber filters, presumably by oxidation of atmospheric sulfur dioxide, thus leading to highly inflated values for particulate sulfate as determined from short-term samples. The discrepancy is reduced with longer-term samples because the formation of sulfate from sulfur dioxide is surface-limited and reaches a saturation level. (Author abstract)##

C1071

J.B. Risk F.E. Murray

CONTINUOUS RECORDING OF SULFUROUS GASES CONCENTRATIONS IN FLUE GASES. Can. Pulp Paper Ind.(Vancouver) 4 pp. Oct. 1964. (Presented at the Fifth International ISA Pulp and Paper Instrumentation Symposium, Vancouver, British Columbia, May 18-23, 1964.)

The methods of analysis used in currently available instruments for the continuous measurement of hydrogen sulfide and sulfur dioxide are critically reviewed. An instrument for continuously measuring the concentrations of these gases in a process stream in the concentration range of 25 to 2500 ppm is described and its advantages over existing instruments illustrated. Some plant results obtained with the instrument are presented. The instrument, which utilizes the analytical system of a commercial ultraviolet analyzer, had been in plant operation for over two months. (Author abstract modified)##

C1086

S. Hochheiser and G. A. Rodgers

EVALUATION OF A VISUAL COLOR COMPARATOR METHOD FOR THE DETERMINATION OF ATMOSPHERIC NITROGEN DIOXIDE. Environ. Sci. Technol. 1(1):75-6, Jan. 1967 1966.

A visual color comparator method for estimation of atmospheric nitrogen dioxide concentration was developed and evaluated. Standard color filters to match colors developed in liquid solutions by reaction of NO2 and the Saltzman reagent were prepared at our request by a manufacturer of visual color comparators. Data obtained by use of the visual color comparator and standard color filters were compared with data obtained by spectrophotometric analysis. The comparison study showed that the visual comparison method agrees with the spectrophotometric method within 20 percent. The use of the visual comparator should be useful in preliminary field surveys over a wide area when short-term measurements of NO2 are desirable, and the use of electric power is not feasible. (Author abstract)##

C1091

F. P. Scaringelli, B. E. Saltzman, and S. A. Frey

THE EFFECTS OF VARIOUS PARAMETERS ON THE SPECTROPHOTOMETRIC DETERMINATION OF SULFUR DIOXIDE WITH PARAROSANILINE. Preprint. 1965.

The reaction of acid-bleached pararosaniline (PRA) and formaldehyde with sulfur dioxide produces an intensely colored

compound that is widely used in this country to determine sulfur dioxide in air by the West-Gaeke method. Since questions have been raised concerning the reliability and reproducibility of the method, the optimum conditions for color intensity and stability were investigated. Modifications suggested by various authors were considered. Some of the parameters examined were stability of the collected samples to light and aeration at various strengths of tetrachloromercurate (TCM); effects of various concentrations of sulfamic acid, formaldehyde, PRA, and hydrochloric acid on final color; methods of preparation of dye reagent; and times for maximum color development at various temperatures. Results suggested the use of a weaker TCM absorbing reagent and indicated that acidity of the solution (pH), purity of the dye, and method of preparation of the dye solution are critical factors affecting the intensity of the color produced. Sensitivity for sulfur dioxide reaches a maximum plateau at pH 1.6 to 1.9. The reduction in response produced by adding other reagents (TCM, sulfamic acid, etc.) can be minimized, if not entirely eliminated. A simple extraction purification procedure for the dye is proposed for the reduction of the reagent blank. The new blanks are close to the minimum ones theoretically obtainable for the final conditions of pH and concentration of PRA. (Author abstract)##

01114

A. D. Bailey and R. S. Narcisi

MINIATURE MASS SPECTROMETERS FOR UPPER ATMOSPHERE COMPOSITION MEASUREMENTS . Air Force Cambridge Research Labs., Bedford, Mass., Office of Aerospace Research. (Rept. No. AFCRL-66-148 and Instrumentation Papers, No. 95.) Feb. 1966. 40 pp.
CFSTI,DDC: AD 631 276

A basic quadrupole mass spectrometer system for neutral and ionized gaseous composition measurements of the upper atmosphere is described. Emphasis is placed on the electronic circuits used with a particular miniature quadrupole rod assembly and ionizer. Circuits described include the power converter, scan waveform generator, dc and rf excitation generators, logarithmic output current amplifier, ion source filament emission regulator and signal-conditioning circuits for telemetering. A summary of performance specifications and critical design dimensions is included. (Author abstract)##

01162

V. H. Regener and L. Zolotnitzky

THE PREPARATION OF CHEMILUMINESCENT SUBSTANCE FOR THE MEASUREMENT OF ATMOSPHERIC OZONE . New Mexico Univ., Albuquerque, Dept. of Physics and Astronomy AFCRL-66-246, (Final Rept.) April 5, 1962 - Mar. 31, 1966. March 31, 1966. 29 pp.
CFSTI,DDC: AD 632562

The general objectives, which consisted of the development and fabrication of chemiluminescent ozone sondes and related ground equipment, are discussed. The details of the procedure for the preparation of the chemiluminescent substance, the construction of an accurate source of small concentrations of ozone for calibration purposes, and the method for the evaluation of ozone measurements from balloons with the chemiluminescence method are discussed. (Author abstract modified)##

01169

D. L. Ripley, J. M. Clingenpeel, and R. W. Hurn

CONTINUOUS DETERMINATION OF NITROGEN OXIDES IN AIR AND EXHAUST GASES . Intern. J. Air Water Pollution 8, 455-63, 1964.

Nitric oxide is the principal nitrogen oxide present in automobile exhaust gases and in photochemically reactive systems important to air pollution studies. However, only the dioxide is readily determined in instruments that are available and suitable for exhaust research applications. Therefore, in order to use these instruments for determination of nitric oxide it is necessary first to convert the simple oxide to the dioxide form. A solid chemical oxidant has been developed to effect this conversion in a continuous process appropriate to the analytical requirement. The oxidant is particularly useful in atmospheric analyzers used in air pollution studies. The oxidant is prepared by saturating glass fiber paper with a solution of sodium dichromate and sulfuric acid and then drying. A small amount placed in a glass tube through which the gas sample is passed will have no effect on the nitrogen dioxide present in the input and will oxidize the nitric oxide to nitrogen dioxide, after which the total of the two may be determined as nitrogen dioxide. (Author abstract)##

01170

A. T. Rossano, Jr. and R. F. Pueschel

SIGNIFICANCE OF VISIBILITY STUDIES IN AIR POLLUTION CONTROL. Preprint. (Presented at the Third Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Vancouver, British Columbia, Nov. 2-4, 1965.)

The many variables affecting the passage of light through the atmosphere in such a manner as to cause restriction of visibility, and the manner in which this knowledge can be used effectively in air pollution technology are discussed. The parameters discussed are: contrast; scattering and absorption; refractive index; and meteorological conditions. Instrumentation and experimental results are also discussed. Little is known as to the relation of the discussed parameters to visibility. However, instruments and methodologies being developed show great promise in improving knowledge in this field. The information resulting from research would provide a more scientific basis for control of particulate air pollution.##

01188

R. T. H. Collis, M. G.H. Ligda, and D. E. Bruce

NAVAL APPLICATIONS OF METEOROLOGICAL LIDAR (FINAL REPT.)
Stanford Research Inst., Menlo Park, Calif. Jan. 1966.
45 p. (Rept. NWRC-2485)
DDC: AD 481 140

As an atmospheric probe and a form of rangefinder, meteorological lidar has many possible applications in naval operations. It can be used for detecting and measuring clouds; determining visibility; observing dust, smoke, haze, and even the invisible (to the eye) particulate matter in "clear air"; measuring wind; and, possibly, determining the properties of the gaseous atmosphere by spectroscopy. Actual accomplishments in certain of these roles are described. Identification is made of the role of meteorological lidar in the observation of meteorological phenomena, both for the aerologist and for direct application in various naval operations. Further potential and possible operational applications of meteorological lidar are discussed. Meteorological lidar, in its present form, would have only limited applications in naval operations. The limiting factor is in the display and presentation of data; however, relatively little development would be needed to achieve an intermediate model suitable for operational use, using rapid process photography or magnetic recording techniques. However, practical and rugged high-PRF systems must be developed for optimum meteorological lidar performance in naval operations. High PRFs would greatly improve the performance of meteorological lidar and would enable straightforward solution(s) of the display problem. Identification is made of scientific and technological problems that warrant early attack. (Author abstract) ##

01192

S. Cravitt, M. Lippmann, and P. Lilienfeld

STRATOSPHERIC MONITORING PROGRAM (SEMI-ANNUAL PROGRESS REPT. MAR. 1964 - AUG. 1964). Del Electronics Corp. Mount Vernon, N. Y. Dec. 10, 1964. 43 pp. (Rept. No. NYO-2363-2)
CFSTI: NYO 2363-2

The following developments are reported in the status of the stratosphere aerosol sampling program. The Model II Electrostatic Precipitator comprising a 37-tube corona discharge array has been designed and preliminary construction and assembly of a unit adequate for sampling up to 150,000 feet has been undertaken. A fully operatinal version of the Del Model P-2 Electrical Discharge Altimeter has been built. The altimeter range of operation is between 75,000 and 180,000 feet. Its reproducibility, under the same conditions of temperature and pressure, is within 0.1%, while its accuracy is dictated by naturally-occurring departures from the standard altitude-pressure curve. In general, with pressure or temperature departures of plus or minus 20 percent from the 1962 Standard Atmosphere,

altitudes at ten to the fifth power feet will be known with an accuracy of better than plus or minus 5 percent. An accurate flowmeter based on ion tracer principles has been designed and a breadboard prototype of an operational system has been assembled. The flowmeter is capable of measuring the desired flowrate between ten to the fifth power and 1.5 x ten to the fifth power feet with an accuracy of plus or minus 5%. Preliminary telemetry and recording considerations have been evolved for the next series of flights employing the Model II Electrostatic Precipitator. Detailed sample recovery techniques have been worked out for the 37-tube sampling configuration. (Author abstract and summary) **

01208

E. R. Stephens and F. P. Burleson

ANALYSIS OF THE ATMOSPHERE FOR LIGHT HYDROCARBONS. J. Air Pollution Control Assoc. 17, (3) 147-53, Mar. 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-108.)

A procedure has been developed for the analysis of trace quantities of light hydrocarbons in air. A freeze-trap filled with chromatographic packing was installed in place of the gas sample loop of a flame ionization chromatograph. An air sample of 0.1 to 0.5 liter volume was passed through the trap which was chilled with liquid oxygen. The trap was then brought to ice temperature and its contents simultaneously swept into the column. The resulting chromatogram could be used to determine about twenty-five hydrocarbons through n-hexane. The minimum detectable concentration was below one ppb for these hydrocarbons. With such sensitivity it is possible to make useful measurements even on samples of light air pollution. Air samples from the Riverside area were analyzed in this fashion starting in the summer of 1965. The relative amounts of these hydrocarbons were then compared with the distribution reported for the various known hydrocarbon sources. The attenuation of the more reactive hydrocarbons by photolysis was also observed. A system for irradiating trapped air samples was also constructed. Samples were collected in five gallon brosilicate bottles which were then irradiated with ultraviolet radiation and the concentration changes followed. (Author abstract) **

01236

A. L. Linch, S. S. Lord, Jr., W. A. Kubitz, and M. B. DeBrunner

PHOSGENE IN AIR - DEVELOPMENT OF IMPROVED DETECTION PROCEDURES. Am. Ind. Hyg. Assoc. J. 26, 465-74, Oct. 1965. (Presented at the 25th Annual American Industrial Hygiene Conference, Philadelphia, Pa., Apr. 27-30, 1964.)

Air-borne acids, alkalies, and halides introduced intolerable uncertainties into the hydrolysis of phosgene to acid and chloride

ion in aqueous collection media. Colorimetric detectors produced reliable results in (1) liquid reagents, (2) impregnated paper, and (3) granular solids. "Ketone" (4,4'-dimethylaminobenzaldehyde in Harrison's reagent in liquid systems was sensitive to 0.1 to 10 ppm of phosgene but insensitive to SO2, H2S, HC1, NO2, or C12. Application of Witten and Prostak's 4-(4'-nitrobenzyl) pyridine reagent to paper delivered semiquantitative results by color comparison or gas titration. Adaptation to chlorinated solvents gave sensitivity to 0.01 ppm and a unique calibration technique. A commercial granule-filled length of stain tube further extended mobile survey facilities. (Author abstract)##

01240

I. Skare

GENERATION AND DETERMINATION OF OZONE IN LOW CONCENTRATIONS. Intern. J. Air Water Pollution 9, 601-4, 1965.

An ozone generator has been constructed, based upon the ultraviolet irradiation of oxygen or air. By means of electrical regulation of the lamps and mechanical shading of the produced light reproducible concentrations of ozone between 0 and 200 ppm can continually be obtained. The apparatus has been shown to be useful for many analytical purposes in connection with air pollution studies, but it would also be suitable as a generator for exposition experiments. For the determination of ozone in low concentrations an indirect titrimetric method is recommended, based upon the ozone absorption in a neutral buffered potassium iodide solution. (Author abstract)##

01266

I. Cherniack and R. J. Bryan

A COMPARISON STUDY OF VARIOUS TYPES OF OZONE AND OXIDANT DETECTORS WHICH ARE USED FOR ATMOSPHERIC AIR SAMPLING . J. Air Pollution Control Assoc. 15, (8) 351-4, Aug. 1965.

Four continuous automatic analyzers for measurement of atmospheric levels of ozone were used in a calibration and field study. These were (1) a colorimetric instrument based upon detection of iodine released from neutral potassium iodide reagent, (2) a coulometric instrument utilizing the polarization current as a measurement of iodine released by ozone in a cell contacted by potassium iodide reagent, (3) a galvanic cell measuring bromine release by ozone, and (4) an ultraviolet photometer. Some ozone determinations by the manual rubber cracking procedure were included. After calibration with ozone the average relative response to atmospheric ozone levels for each instrument was determined using the colorimetric oxidant analyzer as an arbitrary standard. These responses ranged from 77 percent for the galvanic cell to 98 percent for the photometer. The instrument of choice for any given application would seem to be governed by requirements for precision specificity, portability, reliability, and ease of operation. (Author abstract)##

01302

S.S. Epstein, M. Small, E. Sawicki, H.L. Falk

PHOTODYNAMIC BIOASSAY OF POLYCYCLIC ATMOSPHERIC POLLUTANTS. J. Air Pollution Control Assoc., Vol. 15(4):174-176, April 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

A photodynamic bioassay which can be conducted on one mgm amounts of organic atmospheric particulates is described. The results of a pilot study on pollutants from several American cities indicate that the assay may provide a rapid, simple and economical biolcgical index of potential carcinogenic hazard attributable to polycyclic compounds. The utility of the assay for this purpose is under further evaluation. (Author abstract)##

01304

W.B. Barlage, Jr. F.C. Alley

SAMPLING AND MASS SPECTROMETER ANALYSIS OF REACTION PRODUCTS FROM THE PHOTOCHEMICAL DECOMPOSITION OF VARIOUS OLEFINS. J. Air Pollution Control Assoc., 15(5):235-238, May 1965.

Results of this investigation have shown the sampling technique described in this paper to have ptential for mass spectrometer analysis of trace products from the photochemical decomposition of olefins. In addition, preliminary results of this investigation using 1-pentene and 1-hexene as reactants, along with nitrogen dioxide in air mixtures, have shown the presence of compounds or ion fragments of compounds with molecular masses as high as 166 and possibly higher. More work is needed to determine if these compounds are indeed peroxyacyl nitrites or nitrates, "compound X," or perhaps some from of a polymer produced in the photochemical reactions.##

01331

A.F. Wartburg, A.W. Brewer, and J. P. Lodge, Jr.

EVALUATION OF A COULOMETRIC OXIDANT SENSOR. Intern. J Air Water Pollution, Vol. 8: 21-28, 1964.

The American commercial version of the ozone "transmogrifier", a coulometric ozone sensor, developed by one of the authors has been tested for reliability, accuracy and specificity. As with most instruments some substances interfere. The only major, positive interferences discovered so far are from peroxyacids and the simplest hydroperoxides. Sulfur dioxide causes a fairly large negative interference. Techniques are described for maintaining

the instrument in good operating condition and for correcting some common malfunctions of the early-type sensors. Despite its relative insensitivity to nitrogen dioxide, the response is still sufficient to permit its use as a nitrogen dioxide monitor in pure systems. Results are given of studies on nitrogen dioxide, of techniques of nitric oxide oxidation, and of field and laboratory ozone measurements. (Author abstract)##

01349

C. B. Thompson and J. O. Ivie

METHODS FOR REDUCING OZONE AND/OR INTRODUCING CONTROLLED LEVELS OF HYDROGEN FLUORIDE INTO AIRSTREAMS. Intern. J. Air Water Pollution (London), Vol. 9:799-805, Dec. 1965.

Methods and equipment are described for reducing ozone in an atmosphere by the addition of metered levels of nitric oxide. The NO is diluted with 50 vol of nitrogen before addition to the ozone containing airstream to prevent premature oxidant of NC to NO2 by oxygen of the air. Simple, reliable dispensing equipment for metering hydrogen fluoride into airstreams at the fractions of micrograms per cubic meter level is also described. This utilizes the constant vapor pressure of HF at 0 C from a relatively concentrated HF solution and variable levels of dispensing are achieved by varying the rate at which air is bubbled through the solution. An automatic valve system is described for providing a 24-hr present schedule of dispensing HF. (Author abstract)##

01357

R.A. Mill, A.H. Hollenbeck, H.J. Paulus

MEASURING THE ENVIRONMENT FOR A BRONCHIAL ASTHMA STUDY. Am. Ind. Hyg. Assoc. J., Vol. 26:510-519, Oct. 1965.

An aerometric study involving the chemical and physical characteristics of the atmosphere is being made in the immediate vicinity of the University of Minnesota campuses in the Twin Cities. The association of asthma incidence in the student boyd to concentrations of air-borne particulates, certain gases, and weather parameters is being determined. A sampling program to determine the particulate and gaseous components of the atmosphere was initiated in order to evaluate the relationship of grain industry pollutants and student asthma. Weather parameters were considered to be of prime importance in the study and were gathered at two locations, one being a television tower equipped with temperature profile instrumentation. Results of several years' study indicated the influence of the grain industry on the total particulate fallout in an area adjacent to the campus. The soiling index from samples at two locations was not high. Concentrations of sulfur dioxide and oxides of nitrogen followed daily and yearly patterns and were below the values found in most midwest cities.

Associations between certain weather parameters were found to be quite high, but between the various weather parameters and the incidence of asthma the association was low, with correlation coefficients between 0.16 and -0.16. (Author abstract modified) ##

01393

R.H. Hendricks L.B. Larsen

AN EVALUATION OF SELECTED METHODS OF COLLECTION AND ANALYSIS OF IOW CONCENTRATIONS OF OZONE. Am. Ind. Hyg. Assoc. J., Vol. 27:80-84, Feb. 1966.

Seven analytical methods for ozone are evaluated. Equipment used for generating the ozone is discussed. Information concerning methods of collection of ozone is presented. Postassium iodide, phenolphthalein, sodium diphenylamine sulfonate, and fluorescein methods are either nonspecific for ozone or lack sensitivity. The dimethoxystilbene method, in our hands, lacked sensitivity and posed reagent difficulties. The NO2-equivalent method is an excellent research procedure and is the method of choice for field investigations where fluctuating NO2 concentrations are not encountered. The rubber-cracking procedure is empirical, but, as an indicator method, its speed, specificity, and simplicity make this procedure attractive to the industrial hygienist, especially for preliminary surveys. (Author abstract) ##

01395

R. Tye, A.W. Horton, I. Rapien

BENZO(A)PYRENE AND OTHER AROMATIC HYDROCARBONS EXTRACTABLE FROM BITUMINOUS COAL. Am. Ind. Hyg. Assoc. J., Vol. 27:25-28, Feb. 1966.

Benzo(a)pyrene, benz(a)anthracene, and other polycyclic aromatic hydrocarbons have been shown to be present in bituminous coal. Extraction with toluene, chromatography on alumina, the Diels-Alder reaction, solubility in concentrated sulfuric acid, and catalytic iodination on alumina were coupled with ultraviolet spectrophotometry and mass spectrometry to obtain quantitative estimates of these compounds in the extracts. (Author abstract) ##

01422

P. A. Leighton, W. A. Perkins, S. W. Grinnell, and F. X. Webster

THE FLUORESCENT PARTICLE ATMOSPHERIC TRACER. J. Appl. Meteorol., Vol. 4: 334-348, June 1965.

This paper describes the current status and discusses the validity of the fluosescent particle (FP) tracer technique. Properties of the material itself, the blower generator, membrane filter, drum impactor, and Rotorod samplers, and of counting techniques, are described. The inherent and operational errors involved are evaluated, and evidence on the atmospheric diffusion, fallout and impaction, and fluorescent stability of the particles is presented. It is concluded that in the present state of development of the technique the errors, in terms of 90% confidence intervals, are approximately plus or minus 5-10% for source strength determination, plus or minus 10-12% (if 300 particles are counted) for dosages determined by the Rotorod, and plus or minus 17-20% for dosages determined by the membrane filter sampler. The effects of atypical diffusion on the validity of the method appear to be insignificant, and fluorescence losses may be controlled by proper selection of materials. For ground releases, the losses by fallout and impaction may amount to form 1% to 10% during the first few miles of travel, depending on the rate of rise of the cloud and the nature of the ground cover. For larger travel distances, if the cloud height exceeds 100 meters the fallout loss should be below 2% per hour. (Author abstract)##

01429

H. Frostling and P. H. Lindgren

A FLAME IONIZATION INSTRUMENT FOR THE DETECTION OF ORGANIC AEROSOLS IN AIR . J. Gas Chromatog., Vol. 4:243-245, July 1966.

An instrument is described for the determination of organic aerosols and vapours in the air. The samples are continuously drawn through a very short inlet tube into a flame ionization detector, which is kept at a slight and constant vacuum. This arrangement is found to permit a quantitative measurement of most organic aerosols with a sensitivity of 0.30 x 10 to the 4th power micron A per gram atom C x 10 to the minus seven power/lit. For aerosol particles equal to or less than 4 micrometer no noticeable effects of deposition in the inlet tubes have been observed. (Author summary)##

01432

C. Bokhoven and H.L.J. Niessen

THE CONTINUOUS MONITORING OF TRACES OF SO2 IN AIR ON THE BASIS OF DISCOLOURATION OF THE STARCH-IODINE REAGENT WITH PRIOR ELIMINATION OF INTERFERING COMPOUNDS . Intern. J. Air Water Pollution, Vol. 10:233-243, April 1966.

A continuous recording instrument for SO2 monitoring in air pollution studies was developed on the basis of the discolouration of a starch-iodine solution. As distinct from the normal procedure, however, the disturbance by interfering compounds, such as nitrogen dioxide and ozone, can be eliminated without affecting the concentration of SO2. By incorporating an integrating

device, 1/2 hr mean values can be printed out. The applicability of these values is discussed with reference to the time constant concept developed by SANDERSON, PENNER and KATZ(1964). (Author abstract)##

01446

P. M. Hamilton

THE USE OF LIDAR IN AIR POLLUTION STUDIES. Intern J. Air Water Pollution, Vol. 10:427-434, 1966.

Progress in laser technology has recently led to the development of powerful optical radar equipment, or "lidar". Lidar can readily detect the small particles which make up the aerosol content of the atmosphere and smoke plumes. Preliminary trials conducted by the Central Electricity Research Laboratories (C.E.R.L.) have shown that lidar has two distinct roles to play in studying the behavior of buoyant plumes. First, it is shown that lidar can detect and track thin smoke plumes at distances of several kilometers, long after they are invisible to the naked eye. Second, it is shown that lidar probes of the atmospheric aerosol can provide a knowledge of the thermal structure of the atmosphere, particularly the presence and location of the temperature inversions which affect plume behaviour. Thus lidar is expected to prove a valuable tool in the C.E.R.I. air pollution research programme. (Author abstract)##

01447

H. P. Sanderson, R. Thomas, and M. Katz

LIMITATIONS OF THE LEAD ACETATE IMPREGNATED PAPER TAPE METHOD FOR HYDROGEN SULFIDE . J. Air Pollution Control Assoc., 16(6):328-330, June 1966.

Field experience with the lead acetate impregnated paper tape sampler has indicated that large errors may arise in this method due to fading of the color of the precipitated lead sulfide spots. This fading is due to the action of light, sulfur dioxide, ozone, or other substances capable of oxidizing lead sulfide. The moisture content or relative humidity of the air sample must be maintained at an appropriate level to ensure reaction with the impregnated paper tape. The effects of the factors have been investigated in laboratory experiments with known concentrations of H_2S. A number of antioxidants were studied in relation to the stability of the resultant spots to light and oxidation. Orthophenyl phenol was found to be the most effective antioxidant for this purpose. A number of necessary precautions to be employed in the use of the lead acetate method are recommended and the limitations are discussed. (Author abstract)##

01462

T. S. Iyengar, S. H. Sadarangani, S. D. Soman, S. Somasundaram, and P. K. Vaze

A PORTABLE MONITOR FOR THE ESTIMATION OF TRITIUM IN AQUEOUS SAMPLES. Am. Ind. Hyg. Assoc. J., Vol. 27:288-292, June 1966.

A portable instrument utilizing an ionization chamber for the estimation of tritium in aqueous samples is described. The ionization chamber is filled with acetylene from the test specimen by simple displacement of air. The ionization current resulting from the beta disintegrations of tritium is measured by a sensitive electrometer. The instrument, which is highly useful in field work for checking spot samples of irradiated heavy water, cold-strip air samples, etc., has a fairly linear response over a wide range of specific activity values. (Author abstract modified) ##

01495

A. A. Strong and J. F. Horton

THE INSTRUMENTATION FOR AUTOMATIC MEASUREMENT AND RECORDING OF LABORATORY-PRODUCED AUTOMOBILE EXHAUST. Preprint. 1966.

A system that automatically measures and records the concentration of six different gases from twelve animal exposure chambers supplied with diluted, laboratory-produced automobile exhaust and other gases is described. The gases are sequentially fed from the animal exposure chambers to the appropriate gas analyzing instrument. Multipoint recorders connected to the output of the gas instruments register the concentrations and control the sequence of the gas measurements. A data acquisition system is also connected to the output of of the gas instruments to record on a punched paper tape the time of measurement and the gas concentration. The data are punched on cards or inserted directly into a digital computer for analysis. (Author abstract) ##

01577

A.E. O'Keeffe G.C. Ortman

PRIMARY STANDARDS FOR TRACE GAS ANALYSIS. Anal. Chem. 38(6):760-763, May 1966. (Presented at the Division of Water, Air, and Waste Chemistry, 150th Meeting, ACS, Atlantic City, N.J., Sept. 12-17, 1965.)

The permeation rates of gases enclosed in sections of plastic tubing permit the dispensing of nanogram quantities at will. Following an initiation period of a few hours to several weeks, permeation proceeds at a highly constant rate until

the enclosed gas is nearly exhausted. The rate of permeation is highly temperature-dependent, but is independent of pressure and composition of the atmosphere. Methods for the fabrication, calibration, and use of permeation tubes are described. Data are presented to illustrate the precision of these methods. (Author abstract)##

C1625

F. I. Mitchell and H. P. Engdahl

A SURVEY FOR IMPROVED METHODS FOR THE MEASUREMENT OF PARTICULATE CONCENTRATION IN FLOWING GAS STREAMS (INFORMATIVE REPT. NO. 1). J. Air Pollution Control Assoc. 13, (11) 558-63, Nov. 1963. (TA-5 Committee)

The literature survey revealed three primary approaches for determining the dust content of a gas: (1) The dust contained in a known volume of the gas can be separated and weighed. (2) Certain physical characteristics of the dust particles such as radioactivity, dielectric constant, and ability to take on a charge in an ion atmosphere can be related to the mass of the particles. (3) The attenuation of some energy source, such as light, sound, or atomic radiation, passing through the aerosol can be related to concentration. Several new techniques for monitoring dust loadings were revealed. Although none of them appear to meet all of the requirements for a universal dust meter, several, including a modified electrostatic precipitator, a radioactive thickness gage, and a new optical density meter, appear to have promise for development into highly accurate dust meters.##

01683

R. Klein, F.E. Rebbert, R. Stair, R.S. Tipson

AIR POLLUTION PROGRAM, NATIONAL BUREAU OF STANDARDS (QUARTERLY REPT. OCT. 1, 1965 TO DEC. 31, 1965.) National Bureau of Standards, Washington, D.C., Divisions of Analytical Chemistry, Metrology, and Physical Chemistry (Rept. No. 9031). (NBS with PHS Support) 1965.

Progress is reported on: the purification of naphthacene; anthraquinone derivatives; oxidation products of pyrene; oxidation products of perylene; photochemical reaction on the solid particulates anthracene and pyrene; photochemical reactions of pyrene on Maryland soil; photochemical reactions of pyrene on silica gel-alumina; photosensitized decomposition of 3-methylpentanal; surface chemistry; and solar radiation.##

01685

F.L. Meadows W.W. Stalker

THE EVALUATION OF COLLECTION EFFICIENCY AND VARIABILITY OF SAMPLING FOR ATMOSPHERIC NITROGEN DIOXIDE. Am. Ind. Hyg. Assoc. J. 27, 559-66, Dec. 1966. (Presented at the 26th Annual Meeting, American Industrial Hygiene Association, Houston, Tex., May 3-7, 1965.)

A study of the efficiency and variability of the sampling system used to collect nitrogen dioxide in the Alabama Air Pollution and Respiratory Disease Study is described. Experimental sampling was conducted to establish collection efficiency and variability of single and multiple bubblers in series, equipped in each case with either fritted-tip or restricted-opening air dispersers. Comparative evaluation of 0.4 to 0.5 lpm and 0.2 to 0.3 lpm air-flow rates indicated that higher collection efficiency, but greater variability, can be expected with lower air-flow rates. Although fritted-tip bubblers were found to be more efficient than restricted-opening bubblers, restricted-opening bubblers are preferable because their variability is about half that of the fritted-tip bubblers. Sampling variability apparently was not affected by ambient air temperatures, humidity, or the concentration of collecting solution used. Collection efficiency, variability, and the method for empirically determining these factors should be specified when reporting ambient atmospheric nitrogen dioxide. (Author abstract)##

01690

R. Stair, W. R. Waters, J. K. Jackson

PHOTOELECTRIC FILTER MEASUREMENTS OF SOLAR ULTRAVIOLET IRRADIANCES AT LOS ANGELES, CALIFORNIA, OCTOBER 1965. National Bureau of Standards, Washington, D.C., Metrology Div. (Rept. No. 9034). (NBS with PHS Support) 1965. 27 pp.

The available solar ultraviolet irradiance was measured in both a polluted area and a nearby area relatively free of pollution. Special instrumentation and techniques which were used are described.##

01691

E.C. Tabor C.G. Golden

RESULTS OF FIVE YEARS' OPERATION OF THE NATIONAL GAS SAMPLING NETWORK. J. Air Pollution Control Assoc. 15 (1) 7-11, Jan. 1965.

Sampling for nitrogen and sulfur dioxides was initiated at several National Air Sampling Network stations in 1959 using a sampler developed for that purpose. In 1961 the Gas Sampling Network was expanded to its maximum of 49 stations. Sampling equipment and collecting solutions are supplied and chemical analyses performed by the network laboratories. Sampling and analysis procedures are described briefly. Average and maximum 24-hour concentrations of nitrogen dioxide and sulfur dioxide observed at 48 stations during 1961-1963 are presented. (Author abstract)##

01711

R. Johne and R. Doll

AUXILIARY DEVICES FOR THE ACCELERATED EVALUATION OF PHOTOSEDIMENTATION PARTICLE ANALYSIS. STAUB (English Transl.) (Duesseldorf) 26(1) 18-21, Jan. 1966.

Two devices are described which accelerate the evaluation of a photosedimentation analysis. Recording of the intensity-time relationship is required here. One arrangement is a sort of slide rule which permits the transmission particle size relationship to be checked immediately. The other device is a drawing board with special coordinate divisions. By means of this arrangement the relationship between transmission and particle size can be converted graphically to the distribution desired. (Author summary)##

01735

E. Sawicki, T. W. Stanley, W. C. Elbert, and J. D. Pfaff

APPLICATION OF THIN LAYER CHROMATOGRAPHY TO THE ANALYSIS OF ATMOSPHERIC POLLUTANTS AND DETERMINATION OF BENZO(A)PYRENE. Anal. Chem. 36, (3) 497-502, Mar. 1964.

Rb-values, and fluorescent colors have been obtained through thin-layer chromatography of 20 polynuclear aromatic hydrocarbons with the following absorbents and developers: alumina with pentane: ether (19:1; v./v.); cellulose acetate with ethanol:toluene:water (17:4:4; v./v.); and cellulosxecellulose with dimethylformamide:water (1:1, v./v.). Of the three absorbents, alumina gave the best separation of fluowescent organic compounds from the organic fractions of airborne and air pollution source particulates. The pattern and fluorescent color of the spots of a thin-layer chromatogram varied with the type of pollution. The cellulose acetate absorbent system gave best results for the separation of the benz-pyrene fraction obtained in column chromatography. The cellulose adsorbent system gave the best results for the separation of the polynuclear aromatic hydrocarbons. The greatest range in Rb-values was obtained with this absorbent. Two methods for the estimation of benzo(a)pyrene

following thin layer chromatography are described. One method involves ultraviolet analysis at 382 millimicrons, the other method involves spectrophotofluorometric analysis in sulfuric acid. (Author abstract)##

01781

F. Sawicki, T.R. Stanley, J.D. Pfaff, W.C. Elbert

THIN-LAYER CHROMATOGRAPHIC SEPARATION OF BENZO(A)PYRENE AND BENZO(K)FLUORANTHENE FROM AIRBORNE PARTICULATES. Chemist-Analyst 53, 6-8, Jan. 1964.

By column chromatography followed by thin-layer chromatography a better separation was obtained. The latter technic is relatively simple and rapid and offers the advantage that enough material can be readily obtained for spectrophotofluorometric study and, with somewhat more difficulty, for absorption spectral studies. It has been found that using a cellulose acetate adsorbent and ethanol-toluene-water as the solvent benzo(a)pyrene and benzo(k)fluoranthene can be readily separated from each other and from other members of the "benzpyrene" fraction. (Author abstract)##

01784

D.F. Adams, F.K. Koppe, W.N. Tuttle

ANALYSIS OF KRAFT-MILL, SULFUR-CONTAINING GASES WITH GLC IONIZAION. J. Air Pollution Control Assoc. 15, (1) 31-3, Jan. 1965

The technique includes the use of two chromatographic columns in series to separate O2, N2,CO,CO2, H2O, H2S, SO2, and CH3SH. Column 1, containing Triton 45 on Chromosorb, separates H2O, H2S, SO2 and CH2SH. Column 2, packed with Molecular Sieve, separates O2, N2, CO2. The conditions required to obtain adequate sensitivity and separation are discussed. (Author abstract)##

01802

T.R. Hauser P.L. Cummins

INCREASING SENSITIVITY OF 3-METHYL-2BENZOTHIAZALONE HYDROZONE TEST FOR ANALYSIS OF ALIPHATIC ALDEHYDES IN AIR. Anal. Chem. 36, (3) 679-81, Mar. 1964.

A modification of the (3-methyl-2-benzothizolone hydrazone test) procedure is described in which the addition of sulfamic acid, in the oxidizing step of the reaction, gives a solution free of turbidity and capable of colorimetric analysis without dilution by acetone. A reduction in the volume of the oxidizing agent originally added in this step further contributes to the

concentration of the color. Although a comparison of this procedure with that of Sawicki shows a loss in molar absorbance, the sensitivity of the method is increased approximately sixfold. This increased sensitivity easily permits the analysis of aliphatic aldehydes in the parts-per-billion range in ambient air.##

01807

R.I. Larsen, F.B. Benson, G.A. Jutze

IMPROVING THE DYNAMIC RESPONSE OF CONTINUOUS AIR POLLUTANT MEASUREMENTS WITH A COMPUTER. J. Air Pollution Control Assoc. 15, (1) 19-22, Jan. 1965.

A first-order differential equation describes the dynamic response of many continuous air sampling instruments. The time constant, lag time, delay time, and response time are all functions of the volume and flow through the sensor reservoir. All of them can be expressed by the same general equation: t equals k sub 3 V/Q, where t is the selected time variable, k3 is a constant appropriate to the particular system and selected time variable, V is sensor reservoir volume, and Q is the flow rate through the reservoir. The time constant is the time a sampler takes to indicate 63.2% of its final response. Select time constants equal to about half of the shortest desired averaging time. Solve the second equation for the reagent flow to give the desired time constant. Selection of such a time constant eliminates spurious "noise" produced by a fast-responding system. It also provides values within 5% of true for atmospheres that change markedly between successive intervals. If a slow-responding system must be used, use the first equation ot increase apparent response time. A digital computer can be programmed to automatically correct all measured values. Similarly, analog circuitry can be installed in an air sampling instrument ot increase or decrease response time. The analog circuitry to increase response time will continuously solve and plot the first equation. (Author abstract)##

01818

G. Seidman, I. J. Hindawi, W. W. Heck

ENVIRONMENTAL CONDITIONS AFFECTING THE USE OF PLANTS AS INDICATORS OF AIR POLLUTION. J. Air Pollution Control Assoc. 15, (4) 168-70, Apr. 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

Pinto bean (Phaseolus vulgaris L.) and tobacco (Nicotiana tobacum L. var. Bel "C" and var. Bel W-3) were grown throughtout the year. Petunias (Petunia hybrida vilm. var. Celestial Rose) and pinto bean (young primary stage) were grown in the greenhouse in 2 1/2 inch diameter plastic pots containing

vermiculite and were subirrigated with a Hoagland's nutrient solution. All other plants were grown in four inch diameter pots containing soil. Chemical control of stomatal opening reduces air pollution injury to plants. Reduction of water to plants has been shown to greatly reduce vegetative damage from photochemical air pollutants. Plants grown in soil are less sensitive to irradiated automobile exhaust than are plants grown in vermiculite. Nutrient level appears to be related to the sensitivity of pinto bean to natural smog. (Author summary modified)##

01839

F. Sawicki and H. Johnson

NEW COLORIMETRIC AND FLUOROMETRIC METHODS FOR THE DETERMINATION OF 1,4-CYCLOHEXANEDIONE. Anal. Chim. Acta 34, 381-6, 1966.

1,4-Cyclohexanedione has been determined by reaction with o-phthaladehyde in sulfuric acid. The determinations are dependent on the formation of a dicationic salt of pentacenequinone. A sensitive and highly selective fluorometric method is recommended for the analysis of 1,4-cyclohexanedione. The method can also be used in spectrophotometric analysis. Many organic compounds, as well as the isomers of 1,4-cyclohexanedione, give negative results. A spot test has been described which can be used for quick preliminary investigations of complex mixtures for 1,4-cyclohexanedione. (Author abstract)##

01871

CONTINUOUS AIR MONITORING PROGRAM IN WASHINGTON, D.C. (1962-1963). Public Health Service, Cincinnati, Ohio, Div. OF AIR POLLUTION. SEPT. 1966. 222 PP.
HEW: 999-AP-23; GPO: 827-234-15

This report presents the results of the operation of the Public Health Service Continuous Air Monitoring Program (CAMP) in Washington, D.C., during 1962 land 1963. Data on atmospheric levels of sulfur dioxide, oxides of nitrogen, total oxidants, total hydrocarbons, and carbon monoxide are summarized, analyzed, and discussed. The data are tabulated as hourly, daily, and monthly mean concentrations; background information about Washington and a description of the instrumentation used are included. (Author abstract)##

01876

Schuette, F. J.

PLASTIC BAGS FOR COLLECTION OF GAS SAMPLES. California Dept. of Public Health, Berkeley, Div. of Labs., AIHL-19, 8p., Dec. 1965. Also: Atmos. Environ., 1(4):515-519, July 1967. ((12)) refs.

Criteria for judging what kind of film is likely to be most suitable for a given application are delineated. Information concerning supply sources of needed materials is provided.##

01922

E. Sawicki, R.A. Carnes, R. Schumacher

SPECTROPHOTOFLUORIMETRIC DETERMINATION OF 3-CARBON FRAGMENTS AND THEIR PRECURSORS WITH ANTHRONE. APPLICATION TO AIR POLLUTION. Mikrochim. Acta, No. 5 929-935, 1967. 5 refs.

Two modifications of an anthrone procedure for the characterization and determination of -CH-CO-CHO and -CH-CHO compounds and their precursors are described. Two main types of fluorescence spectra are obtained. The procedure for analysis of -CH-CO-CHO precursors works well for the aldopentoses; by comparison, aldo and ketohexoses react poorly. Water-soluble fractions of airborne particulates were analyzed by the anthrone procedure. At least three families of compounds were found: two give fluorogens, of which one is a -CH-CO-CHO precursor, and a third gives chromogen(s) absorbing at 423 and 540 microns. (Authors' abstract)##

01979

A. P. Altshuller

GAS CHROMATOGRAPHY IN AIR POLLUTION STUDIES. J. Gas Chromatog. 1, (7) 6-20, July 1963.

Gas chromatography as a powerful tool in the determination of the chemical composition of trace constituents in sources of pollution and in the atmosphere is reviewed. Topics covered include: Calibration Methods; Subtraction Techniques; Detectors (Thermal-Conductivity Detectors; Infrared CO2 Detectors; Electron-Impact Ionization Detectors; Argon Type Ionization Detectors; Flame Ionization Detectors; Flame Ionization Analyzers; Electron Capture Detectors); Column Selection; Identification and Quantitative Analysis; Atmospheric Analysis; Synthetic Atmosphere Analysis; Auto Exhaust Analysis; Blowby Emission Analysis; Diesel Exhaust Analysis; Incinerator Effluent Analysis.##

01989

F. A. Bell, Jr.

MEANINGFUL AIR QUALITY MEASUREMENTS ON A LIMITED BUDGET. J. Air Pollution Control Assoc. 13, (3) 127-31, Mar. 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

Useful short-term air pollution measurement studies have been conducted in a number of cities throughout the country, demonstrating the potential for local air pollution agencies to carry out effective air pollution sampling studies with limited manpower and financial resources. Experience indicates that the shortterm measurement approach is very useful in spreading knowledge and competency regarding air pollution sampling and analytical techniques particularly regarding measurement of gaseous pollutants. Equipment required for short-term sampling involves only modest costs totaling less than $1400, including $393.70 for gas sampling equipment, $626.50 for particulate matter sampling equipment, and $305 for an analytical spectrophotometer, if needed. For agencies with a severely limited budget, acquisition of even these items of equipment could be scheduled over a period of several years, if necessary. (Author summary modified)##

02045

E. L. Kothny and P. K. Mueller

SUB-MINUTE CONTINUOUS NITROGEN DIOXIDE ANALYSIS. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VI/9). pp. 182-4.

A study concerning the effect of chemical and physical variables on the response of a nitrite reagent is described. For performance comparison an empirical parameter was developed. With the guidelines resulting from the application of these numbers a fast-response reagent was developed containing 2-amino-p-benzenedisulphonic and sulphuric acid. Designs of gas-liquid contact and optical systems were evaluated to match fast-response reagents. (Author abstract)##

02063

K. Fukui.

THE ALKALINE FILTER PAPER METHOD FOR MEASURING SULPHUR OXIDES, NITROGEN DIOXIDE AND CHLORIDE IN THE ATMOSPHERE. Proc. (Part I) Intern. Clean Air Cong., London, 1966, 231-2. (Paper VII/7.)

The lead peroxide method for measuring pollution by sulphur oxides is time-consuming and liable to discordant results, because of the quality of lead peroxide. The alkaline filter paper method is not affected by this trouble and can be used for the determination not only of sulphur oxides but also of nitrogen dioxide and chloride in the atmosphere. The test papers, after immersion in a 50 percent potassium carbonate solution and air-drying, are exposed to the atmosphere for one month in louvered boxes. After the test period has elapsed the paper is cut into small pieces and treated with water for the extraction. Sulphur oxides, nitrogen dioxide and chloride are determined by the barium chloranilate method, the diazotizing methods and the mercury chloranilate method respectively. (Author Abstract)##

02064

S. Suzuki.

STUDIES OF AUTOMATIC RECORDING APPARATUS FOR MEASUREMENTS OF OXIDANTS IN AIR. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VII/8). pp. 233-6.

Several types of oxidant measurement apparatus were design and studied. The principle of the first one is as follows: oxidizing gas is passed through a filter paper impregnanted with potassium iodide. As result of the reaction, the colour change is produced on the paper. The colour change is measured by a photometric method and automatically recorded. The principle of the second one is as follows: Oxidizing gas is passed through an aqueous solution of reducing agents in an indicating electrode. The potential difference generated between the indicating and reference electrodes is automatically recorded. The reagent solution, after reaction, is returned to the recovery system and regenerated by active charcoal absorption or by a photochemical method. The chemical behaviours of several reagents to be used for these instruments were investigated. (Author abstract)##

02090

E. Sawicki, T.R. Hauser, T.W. Stanley, W. Elbert, F.T. Fox

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC CHARACTERIZATION AND DETERMINATION OF CARBAZOLES, AZO DYES, STILBENES, AND SCHIFF BASES. APPLICATION OF 3-METHYL-2-BENZOTHIAZOLONE HYDRAZONE, P-NITROSOPHENOL, AND FLUOROMETRIC METHODS TO THE DETERMINATION OF CARBAZOLE IN AIR. Anal. Chem. 33, (11) 1574-9, Oct. 1961. (Presented before the Divisions of Analytical and Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

Two new spectrophotometric methods for the determination of carbazole are introduced. Beer's law was obeyed from 4 to more than 90 micrograms of carbazole in the 3-methyl-2-benzothiazolone hydrazone and p-nitrosophenol procedures. Both methods can be used for the estimation of carbazole in the benzene extracts of airborne particulates. Two new spot tests for carbazole are also introduced. With the p-nitrosophenol test, 0.4 micrograms of carbazole can be detected. In strongly alkaline solution 0.2 micrograms of carbazole can be detected through the brilliant blue fluorescence of the anion. Carbazole can be characterized and estimated in the benzene extract of airborne particulates by the p-nitrosophenol spot test and spectrophotometric procedure, by the 3-methyl-2-benzothiazolone hydrazone (MBTH) spectrophotometric procedure, and by the excitation and emission spectra of the material in pentane, dimethyl-formamide, and alkaline dimethyl-formamide. The detection and determination of approximately 50 azo dyes and a smaller group of stilbene and Schiff base derivatives using 3-methyl-2-benzothiazolone are also described. (Author abstract)##

02093

E. Sawicki, T.W. Stanley, W.C. Elbert

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF NITRITE WITH P-PHENYLAZOANILINE. Anal. Chem. 34, (2) 298-8, Feb. 1962.

An alternative sensitive, simple method for nitrite determination was desired in which the color would be formed in alkaline media. The present paper describes such a new method which is very sensitive and simple in the sense of using only one reagent which is both the substance diazotized and the coupling agent. The mechanism of the present procedure as applied to the nitrite ion includes the following steps: reaction of the nitrite ion with p-phenylazoaniline to give the diazonium salt; combination of p-phenylazoaniline with the diazonium salt to form the triazene; and finally, formation of the blue anion in alkaline solution.##

02095

E. Sawicki W. Elbert

THERMOCHROMIC DETECTION OF POLYNUCLEAR COMPOUNDS CONTAINING THE FLUORENIC METHYLENE GROUP. Chemist-Analyst 48, 68-9, Sept. 1959

A large number of aromatic hydrocarbons and their derivatives contain the 6,5,6-fused, aromatic ring system of fluorene. A simple, sensitive, and specific test for this ring system would be of value in air pollution studies and in organic analysis generally. Sprinzak found that fluorene reacts in a strongly alkaline, pyridine medium with oxygen to yield fluorenone. Sawicki and co-workers found that fluorenone and structurally related ketones give a thermochromic reaction in dimethylformamide containing sodium borohydride involving reduction to the fluorenol and its anion. The new color test for the fluorene moiety is based on a combination of these observations. The fluorene derivative in dimethylformamide made alkaline with tetraethylammonium hydroxide forms a carbanion which is readily oxidized by shaking with air to the fluorenone, and the latter is reduced by potassium borohydride at the boiling point to the highly colored fluorenol anion. On cooling and shaking, the less highly colored fluorenone is regenerated.##

02096

E. Sawicki, T.W. Stanley, T. R. Hauser

A THERMOCHROMIC TEST FOR POLYCYCLIC P-QUINONES. Anal. Chem. 30, (12) 2005-6, Dec. 1958.

Many compounds containing a polyclyclic quinone structure show a reversible thermochromic reaction in reducing media. This test is useful for unsubstituted polycyclic q-quinones, such as 9,10-anthraquinone, 5,12-naphthacenedione, 6,13-pentacenedione, 7,12-benzo(alpha)anthracenedione, and naphtho(2,3-alpha)pyrene-7.12 -dione - e.g., boiling a pink dimethyl-formamide solution of 5,12-naphthacenedione in the presence of potassium borohydride gave a dark blue solution, which upon cooling became pink again. This color change can be repeated at least a dozen times. The color reaction has been applied to air particulate matter in that the presence of polycyclic quinone-like compounds has been demonstrated in the aromatic fraction. (Author abstract)##

02098

A.P. Altshuller L.J. Leng

APPLICATION OF THE 3-METHYL-2-BENZOTHIAZOLONE HYDRAZONE METHOD FOR ATMOSPHERIC ANALYSIS OF ALIPHATIC ALDEHYDES. Anal. Chem. 35, (10) 1541-2, Sept. 1963.

Presented in this study are results of work on controlled synthetic atmospheres which provide data on collection efficiencies and reproducibility and which give further indications of the accuracy of the method. Analyses also were made for formaldehyde and acrolein, and results are compared with those for total aliphatic aldehydes.##

02128

R. Muhleisen

(CONSIDERATIONS ON THE INFLUENCE OF ARTIFICIAL ELECTRIC FIELDS ON THE AEROSOL CONTENT OF INTERIOR SPACES). Uberlegungen zum Einfluss Kunstlicher elektrischer Felder auf den Aerosolgehalt von Innenraumen. Aerosol Forchung (Stuttgart) 13, (2) 129-32, June 1966.

The concentration of condensation clusters and small ions in interior spaces is reduced when an artificial electric field is on for a long time. The origin and properties of charged particles are discussed. Electric fields affect charged particles and also uncharged particles, if they can be polarized. The concentration of aerosol particles can be reduced after several hours, but never completely.##

02135

F. S. Gronsberg

(COLORIMETRIC DETERMINATION OF VINYL CHLORIDE IN THE AIR.) Kolorimetricheskoe Opredelenie Khloristogo Vinila v Vozdukhe. Khim Prom (Moscow) (7) 30-1, 1966.

The method described in this paper is based on the ability of ethylenic hydrocarbons to be oxidized by permanganate to glycol, which on further oxidation with periodic acid yields formaldehyde. The formaldehyde is then determined colorimetrically by reaction with chromotropic acid. The air to be analyzed was passed over activated charcoal; the charcoal was then extracted with a 1:1 mixture of glacial acetic acid and ethyl alcohol. The data indicate that vinyl chloride in air can be detected accurately in quantities as low as 0.5 mg/liter. Methyl alcohol will interfere with the reaction and must be removed by passage through water and CaCl2 before the vinyl chloride is absorbed on charcoal. Ethylene also interferes with the determination.##

02155

A. N. Longfield and W. Bentel.

LUNG DESTRUCTION MEASURED BY ENERGY TRANSMISSION THROUGH FUME FIXED LUNGS. DISEASES CHEST 50, (3) 225-31, SEPT. 1966.

A method is described for determining the amount of lung destruction in pulmonary emphysema on pathological material. Tungsten light, sound at 12.5 KC/sec. and beta radiation were investigated as a means of measuring degrees of lung destruction in inflated fume-fixed lung sections. A scanning and enumerating device is described which is capable of evaluating the entire section. Absorption of light appeared to give an adequate measure of lung destruction and correlated well with the rank order. Correlation of sound with visual degree of destruction was only fair. Beta radiation with the method used showed no correlation. (Author summary)##

02157

A. P. Altshuller, T. A. Bellar, and C. A. Clemons.

CONCENTRATION OF HYDROCARBON ON SILICA GEL PRIOR TO GAS CHROMATOGRAPHIC ANALYSIS. Am. Ind. Hyg. Assoc. J. 23, Apr. 1962. pp. 164-6.

In the determination of substances in various atmospheres by gas chromatography the sample often must be concentrated prior to analysis. Silica gel at dry ice-acetone temperatures has been found to be a satisfactory adsorbant for concentration of hydrocarbon and sulfur containing compounds. In the present work recovery efficiencies are obtained for a number of four and five carbon paraffins and olefins. Isomerization reactions of olefins of silica gel at elevated temperature were investigated. Losses of very light hydrocarbons are discussed. Reproducibilities are given for the analyses of several three, four and five carbon hydrocarbons existing at concentrations between 0.005 and 0.2 ppm in synthetic smogs. (Author abstract)##

02158

A. P. Altshuller, L. J. Lage, and S. F. Sleva.

DETERMINATION OF OLEFINS IN COMBUSTION GASES AND IN THE ATMOSPHERE. Am. Ind. Hyg. Assoc. J. 23, 289-95, Aug. 1962.

Four-carbon and higher molecular weight olefins can be quantitatively determined in the gas phase by reaction with p-dimethylaminobenzaldehyde in concentrated sulfuric acid, heating at 100 C, and measurement of the absorbance at 500 millimicrons. The absorptivities are such that less than 0.1 ppm of gaseous olefins can be determined. Interference by formaldehyde is appreciable. Excess amounts of aromatic hydrocarbons and phenols interfere somewhat in the procedure. Simple methods for removing possible interferences in gas mixtures are discussed. The method has been applied to the analysis of automobile exhaust and diluted irradiated exhaust mixtures. (Author abstract) ##

02159

A. P. Altshuller and C. A. Clemons.
A. P. Altshuller and C. A. Clemons.

GAS CHROMATOGRAPHIC ANALYSIS OF AROMATIC HYDROCARBONS AT ATMOSPHERIC CONCENTRATIONS USING FLAME IONIZATION DETECTION. ANAL. CHEM. 34, (4) 466-72, APR. 1961. (PRESENTED BEFORE THE Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

In the present investigation, methods were developed for preparing and transferring to the chromatograph vapor state aromatic hydrocarbon in air-mixtures in the 0.05 to 5-p.p.m. range. Quantitative analysis of automobile exhaust for six- to 10- or 11-carbon aromatic hydrocarbons in the 1-to 10-p.p.m. range has been demonstrated. Quantitative analyses of synthetic photochemical "smog" have been made on mixtures containing individual aromatic hydrocarbons in the 0.05- to 1-p.p.m. range. The accuracy attained is sufficient to permit measurement of changes in aromatic hydrocarbon concentration during irradiation with solar type light sources. These measurements provide evidence that many aromatic hydrocarbons should photooxidize to an appreciable extent in photochemical "smog" reactions in urban atmospheres. (Author abstract) ##

02162

A. P. Altshuller and S. F. Sleva.

VAPOR PHASE DETERMINATION OF OLEFINS BY A COULOMETRIC METHOD. Anal. Chem. (Presented before the Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.) 34, (3) 418-22, Mar. 1962

An instrument based on a bromocoulometric method has been evaluated for analysis of olefins at concentrations between 20 and 1000 p.p.m. The instrument has been calibrated for its vapor phase response to a number of olefins, including ethylene, propylene, propadiene, 1-butene, trans-2-butene, cis-2-butene, isobutylene, 1,3-butadiene, 1-pentene, and 2-methyl-2-butene. The possible interference of a number of substances, including sulfur dioxide, nitric oxide, nitrogen dioxide, hydrogen sulfide, n-butyl sulfide, acrolein, phenol, and m-cresol, has been investigated. Sulfur dioxide, hydrogen sulfide, nitrogen dioxide, and acrolein react appreciably with the brominating solution. Nitrogen dioxide lowers the response to olefins. Severe interference is experienced when the nitrogen dioxide concentration equals or exceeds that of olefins. Even when the olefins are present in excess, the interference by nitrogen dioxide is sufficient to necessitate removal of most of the latter. In analyses of samples in containers, direct determination of these vapor phase interference effects may be complicated further by gas phase reactions of olefin and nitrogen dioxide, and perhaps by reactions within container walls. With this olefin instrument, diluted automobile exhaust and a variety of synthetic mixtures have been analyzed. Results have compared favorably with those obtained by the colorimetric dimethylaminobenzaldehyde method. (Author abstract) ##

02168

W. L. CRIDER AND J. A. TASH.

STATUS REPORT: STUDY OF VISION OBSCURATION BY NONBLACK PLUMES. J. AIR POLLUTION CONTROL ASSOC. 14, (5) 161-7, May 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich, June 9-13, 1963.)

This study has been directed toward the development of an objective method of measuring vision-obscuration effects of plumes, and some effort has been given to the development of a method of measuring the light transmittance characteristics of plumes independently of the visual-obscuring effects of ambient lighting and background conditions, because the optical properties and also the visibility effects depend to a considerable extent on the actual transmittance of the plume. The experimental technique of measuring the transmittance of plumes outside the stack has proved satisfactory for laboratory plumes, but further study is required to show whether pilot and fullscale plumes will introduce an amount of scattered light so great as to invalidate the method. More work needs to be done before conclusions can be made regarding methods to measure vision obscuration effects.##

02188

D. Persis, and E. Vassiliou.

A CHEMILUMINESCENCE METHOD FOR DETERMINING OZONE. Analyst (Cambridge) 91, (1085) 499-505, Aug. 1966.

A method for determining ozine is described which is characterized by the direct recording and automatic determination of ozone within a wide range of concentrations. The development of the method is based on the use of a chemiluminescent solution that is stable and shows a linear relationship between the light emitted and the ozone concentration. The electronic instrumentation used is simple. Other methods of ozone analysis based on this principle met difficulty, owing to the direct oxidation of the chemiluminescent compound. The present method involves the use of gallic acid as an ozone acceptor, and rhodamine B which remains unchanged during the measurement as a photon emitter. Observations made with an oscillograph of the light emitted by single bubbles of ozonized air passing through the chemiluminescent solution gave valuable information about the response time of the system. (Author abstract modified)##

02199

C. A. Northend, R. Honey, and W. E. Evans.

LASER RADAR (LIDAR) FOR METEOROLOGICAL OBSERVATIONS. Rev. SCI. INSTR. 37, 393-400, APR. 1966.

An experimental high powered, Q switched, ruby laser radar or lidar designed for meteorological applications and upper atmosphere studies is described. The lidar system equations, detailed design, operation, and recommendations for design improvements are discussed, and typical observational data are presented to illustrate the uses of this new meteorological instrument. (Author abstract modified)##

02302

J.S. Nader

DIRECT READING PHYSICAL INSTRUMENTATION. In: Stet 1962. pp. B-8-1 - B-8-12.

Devices which provide a measurement reading directly on an indicating meter, recorder or other display medium associated with the sampling and detection portions of the device are reviewed. The detection and/or analysis is basically by a physical or chemophysical technique.##

02354

K.F. Chrisman K.E. Foster

CALIBRATION OF AUTOMATIC ANALYZERS IN A CONTINUOUS AIR MONITORING PROGRAM. Preprint (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Michigan, June 9-13, 1963.)

The need for uniformity of instrument calibration among the several stations of the Continuous Air Monitoring Program of the U.S. Public Health Service has prompted the development of a comprehensive program of instrument calibration. The program relies heavily upon static and dynamic checks performed by the station operators. The frequency of these checks varies with each specific instrument; but, in all cases, the checks are frequent enough to insure the continued accuracy of the recorded data. The routine checks are substantiated and supplemented by dynamic calibrations performed at all stations by the headquarters staff. The dilution board method for the preparation of standard gas mixtures has been adapted to the requirements of compactness and portability, and has been used successfully in this work, In a conscientious effort to insure and maintain the accuracy of the data produced by the program, further refinements in the method will be made and more suitable new methods will be adopted as they are developed. (Author's summary)##

02363

R. A. McCormick D. M. Baulch

THE VARIATION WITH HEIGHT OF THE DUST LOADING OVER A CITY AS DETERMINED FROM THE ATMOSPHERIC TURBIDITY. J. Air Pollution Control Assoc. 12, (10) 492-8, Oct. 1962.

Observations of the variation from street level to 2000 feet above the surface of the transmissivity of solar radiation at 5000A, near the peak of the solar spectrum, over the past 2-1/2 years at Cincinnati are described. From these observations the vertical variation of the turbidity coefficient is computed and related theoretically, after the manner of Volz, to the number and mass density of particulate in the 0.1 to 1.0 micron (radius) range. The range of mass loading near the surface determined from the turbidity data, 30 microgram/cu m to 200 more than microgram/cu m on the "cleanest" and "dirtiest" days respectively, are good in qualitative agreement with determinations made by other means, adding credence to the validity of the theoretical considerations. The mass loading is found to decay exponentially with height such that at about 600 feet the value is one-half that at street level. This "turbidity technique" for quantitatively assessing the dust loading over a city has considerable advantages over other methods in that the determinations can be made instantaneously and the medium is not disturbed by the process of measurement. Its limitation to daytime observations when there are no clouds in the vicinity of the sun is minimized by the fact that such conditions are often the most significant or critical for providing air pollution problems. (Author abstract)##

02368

J.N. Pitts, Jr. J.H. Sharp

SOME ASPECTS OF THE PHOTOCHEMISTRY OF NITROGEN DIOXIDE. Proc. Tech. Meeting West Coast Sect., Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963. 76-92.

The basic theories and techniques of photochemistry can be applied to gain insight into the mechanism of the photodecomposition of nitrogen dioxide. While this approach is rather "academic" in this particular study, nevertheless, the results have bearing on the problem of photochemical air pollution. Two particularly intriguing questions raised and not answered of considerable basic and practical significance are: (1) can one confidently extrapolate photochemical and kinetic data on NO2 from the mm. pressure range to the ppm. range?; (2) why doesn't the molecule, NO2 a highly reactive compound, react with the common organic constituents of smog, in particular, olefins, when it is raised to an excited electronic state by absorption of 4358A radiation? The search for theoretical and experimental answers to these questions is currently going on. It seems certain that the results will have "practical" applications to photochemical air pollution as well as being of general scientific interest.##

02370

S. Duckworth E. Kupchanko

AIR ANALYSIS: THE STANDARD DOSAGE-AREA PRODUCT. J. Air Pollution Control Assoc. 17, (6) 379-83, June 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-94.)

The dosage-area product (DAP) is offered as a feasible, low-cost, and operationally useful data analysis output. It is in essence a smog index obtained by multiplying the contaminant dosage by the geographical area affected. Thus it represents the intensity and extent of an air pollution episode. The basic concepts of dosage and dosage-area, and some standard constraints for obtaining reproducible index values are discussed. Several practical uses of the DAP smog index are illustrated. It can be readily computed from a daily map showing the areal extent of contaminant dosage. The DAP Smog Index is recommended as a feasible aid in presenting and analyzing past, current, and future air quality conditions. It is suggested for use in studies of smog patterns, pollutant trajectories, smog experience, pollutant trends, and smog forecasting.##

C2377

SLATER, R. W.

LOW-COST MEASUREMENT OF AIR POLLUTION. (IN: PROCEEDINGS OF THE EIGHTH ANNUAL AIR AND WATER POLLUTION CONFERENCE.) Univ. Mo. Bull. 64 (24), 49-53 (Aug. 26, 1963). Also published in Ind. Water Wastes 8 (6), 30-3 (Dec. 1963). (Presented at the Eighth Annual Air and Water Pollution Conference, Columbia, Mo., Nov. 13, 1962.)

An air pollution monitoring program is described that can be initiated and maintained by a local air pollution agency or health department at a moderate cost. Simple, inexpensive methods of sampling and analysis for gaseous pollutants and particulates are outlined and a detailed equipment cost breakdown is given. (Author summary)##

02406

A.F. Barrington

INSTANTEOUS MONITORING OF MULTICOMPONENT EXPIRED GASES. GCA Corp., Bedford, Mass. (Rept. CR-619.) Dec. 1966. 17 pp. CPSTI, NASA

Because of the urgent requirements of the manned space flight program, the prototype gas analyzers described below were developed specifically for aerospace applications. Their design thus inevitably was subject to restrictions of weight, volume and power consumption. Nevertheless, their operational performance has been most encouraging. The sensing element of the gas analyzer is called a mass spectrometer whose concept utilizes two basic physical phenomena: first, gaseous atoms and molecules can readily be charged electrically; second, there is a selective effect by electric and magnetic forces on such charged particles which depends on the atomic or molecular mass. A complete sampling and sensing system for 12 constituent gases, utilizing a magnetic deflection mass spectrometer is shown. It is designed to monitor H2, CO, CH4, NH3, H2O, N2, COH, O2, H2S, HC, CO2 AND COOH. IT includes 4 sample inlet capillaries, a calibration sample, a liquid nitrogen chilled sorption pump and an electronic ion pump.##

02415

C.W. Louw

ATMOSPHERIC POLLUTANTS AND THEIR ANALYSIS (SPECIAL REPORT SMOG 2). Council for Scientific and Industrial Research, Pretoria, (South Africa). Air Pollution Research Group 1966. 60 pp.

In view of the recently passed Act on Air Pollution (No. 45 of 1965) in South Africa and the anticipated increase in interest and analytical activity in this field, it was felt that the need existed for an up-to-date survey of air pollutants and their analysis. A review report was consequently prepared and is presented here. Aspects such as the types, sources and occurrence, concentrations and methods of analysis of the various pollutants are discussed. Also, recommendations are made with regard to the selection of suitable analytical methods. (Author abstract)##

02439

A. V. Demidov, L. A. Mokhov, and B. S. Levine (Tr.)

RAPID METHODS FOR THE DETERMINATION OF HARMFUL GASES AND VAPORS IN THE AIR. Vol. 10 of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Medgiz, Moscow, Russia. (Technical Transl. No. TT 66-11767.) 1962. pp. 114.

Volume 10 of the survey series "U.S.S.R. Literature on Air Pollution and Related Occupational Diseases" is a translation of A. V. Demidov's and L. A. Molhov's book "Rapid Methods for the Determination of Harmful Gases and Vapors in the Air" (Yekopehhlie Metoubi Oiipeuejiehnr B B Boeuyxe Bpeuhlix N Iopooopaehlix Bewectb), published by Medgiz of Moscow in 1962. The greater part of the outlined procedures have been developed by U.S.S.R. analytical chemists, while some were taken from literature of other countries. The collection of tests appears to be intended primarily for the detection of dangerous gaseous and vaporous air pollutants in indoor working premises. For each harmful gas or vapor qualitative as well as closely approximate quantitative procedures are given to make possible the early determination of dangerous harmful gas and vapor concentration in the air of working premises and to forestall the occurrence of serious accidents. The volume was intended to meet the needs of smaller laboratories and of field industrial laboratory workers.##

02441

M. E. Eaton, Jr.

AN ELECTROCHEMICAL SENSOR FOR DETECTING TRACE CONTAMINANTS IN AIR (MASTER'S THESIS). Air Force Inst. of Techn., Wright-Patterson AFB, Ohio, School of Engineering. Aug. 1963. 88 PP.
CFSTI AD 422659

A two-terminal electrochemical cell was used to detect trace amounts of an oxidizing agent in air. An investigation of the cell's electrical parameters was made while the cell was in uncontaminated air, and while exposed to chlorine or nitrogen dioxide. An equivalent was obtained. The cell, without any external power or circuitry, can detect concentrations below the threshold limit values for chlorine and nitrogen dioxide. The cell output can be increased by passing a small DC current through the cell. This current also improves the cell's recovery time.##

02492

M. E. Morrison, R. G. Rinker, and W. H. Corcoran.

QUANTITATIVE DETERMINATION OF PARTS-PER-MILLION QUANTITIES OF NITROGEN DIOXIDE IN NITROGEN AND OXYGEN BY ELECTRON-CAPTURE DETECTION IN GAS CHROMATOGRAPHY. Anal Chem. 36(12):2256-2259, Nov. 1964

An electron-capture detector was used in a gas chromatography to measure parts-per-million quantities of nitrogen dioxide in a ternary mixture of nitrogen, oxygen, and nitrogen dioxide. For concentrations of nitrogen dioxide from 5 to 150 p.p.m. and for oxygen present to the extent of 9% by volume in nitrogen, the standard deviation of the best curve through the points showing response vs. concentration was 2 p.p.m. compared to about 3 p.p.m. for chemical techniques. The main advantages of gas chromatography are the short time for analysis and the small samples (.5 cc) required. (Author abstract)##

02518

C. C. Matle, C. D. Stout, and R. Zielonka

DEVELOPMENT OF AN OZONE SENSOR FOR ATMOSPHERIC SOUNDING. Bendix Corp., Detroit, Mich., Research Labs. Div. Dec. 15, 1961. 180 pp.
CFSTI, DDC: AD 632790

This report describes the development of a new type of ozone sensor for use at high altitudes of the atmosphere. The basic concept employed was the detection of the surface reaction of ozone with a thin, solid film of silver by the measurement of changes in film electrical conductivity. This sensor is useful for the detection of ozone at high altitudes and in the dark can be used in rocketsondes and balloonsondes. It is simple, reliable, and can be produced economically even in small quantities. When prepared for production in moderate quantities, this sensor will have a very attractive unit cost. It is small, light and has simple sampling requirements. The report describes all the aspects of development, design, and laboratory and environmental tests. Sonde field tests, not completed at the time of writing, will be described in a subsequent report. (Author abstract)##

C2520

A. P. Mitra

AN IONOSPHERIC ESTIMATE OF NITRIC OXIDE CONCENTRATION IN THE D-REGION. Pennsylvania State Univ., University Park, Ionosphere Research Lab. (AFCRL-66-359) (Scientific Rept. No. 265) Feb. 15, 1966. 24 pp.

It is shown that the dissimilar nature in the solar cycle variations in the three major competing ionizing sources for the D-region (e.g. X-rays below 8A, Lyman-alpha radiation and cosmic rays) can be used to provide an estimate for the concentration of the neutral nitric oxide at and near 70 km. Use of the electron density profiles recently given by Deeks (1965) for sunspot minimum and maximum conditions for equinox in middle lattitudes gives a nitric oxide concentration of 400000/cc around 72 km, about one hundredth of Barth's rocket-deduced value. When this value is integrated with currently available photochemical information, the following empirical distribution is indicated: n(NO) equals 0.02 exp (- 3300/T)n(02) plus C.CC00005 n(O). (Author abstract modified) ##

02538

(CHEMICAL AND PHYSICAL CHARACTERIZATION OF POLLUTED ENVIRONMENTS, INHALED OR INGESTED, AND OF ACOUSTICAL "NUISANCES.")
Caracterisation chimique et physique des milieux pollues, inhales ou ingeres et des "nuisances" acoustiques. In: Les pollution et "nuisances" d'origine industrielle et urbaine. Tome 1. Leur prevention et les problemes scientifiques et techniques qu'elle pose en France, pages 27-32. Premijer Ministre Delegation generale a la recherche scientifique et technique.

In discussing the methodolcgy cf measuring and evaluating the degree of pollution, the following are considered: infra-red, emission, and mass spectrometers; x-ray and electron diffraction; gravimetric, volumetric, and colorimetric methods; optic and electronic microscopes, and spectometry for acoustic absorption. In the section cn the inhalation milieu, are discussed the composition of the natural atmospheric air and of the air polluted by cities (particles, gases and vapors, and smog); diffusion of pollutants in the atmosphere; chemical reactions in the atmosphere; international standardization of current methods and measurements (deposited material, fumes, sulfur dioxide, and hydrocarbons); cartiography; and principal concerns of research. Discussed in this same section (chapter 2) are pollution cf food and water, and problems of noise.##

02645

R. Hummel

INDUSTRIAL GAS MEASUREMENT FOR CLEAN-AIR MAINTENANCE. Staub (English Translation) 25, (2) 11-18, Feb. 1965
CFSTI: TT 66-51040/2

This article deals mainly with emission-concentration measurements directly concerning the plant. In addition, trace-element recorders for immission control in the plant area or outside it was also mentioned. Several plants use mobile recording stations for this purpose. Apart from current control, immission instruments will in future be important for the determination of ground

loading. The ground loading in respect to a specific noxious substance (e.g., SO2) is a measure of the average degree of nuisance caused by immissions in a certain area. For a planned installation, e.g., a boiler plant, the ground loading for the basis for chosen location must be ascertained. This forms the basis for granting the building permit. According to suggested and practiced methods, the ground loading is established in the following manner. Numerous points are established in a fixed coordinate grid around the location to be examined. Individual sampling is carried out at these points by a fixed program over a long period. By using a precisely determined statistical evaluation method, the ground loading can be deduced from the data. The statistical character of the immission, which depends on wind and atmospheric conditions, is thus taken into consideration. The reliability of this still imperfect method cannot be discussed; it is however certain that this method is expensive and requires considerable manpower. On the other hand, it can easily be shown that given a correct evaluation of the strip charts (possibly by electronic scanning) the use of recording instruments at a few points will provide an equally reliable measure of ground loading at less expense. This method would also include the nightime which hitherto has not been included. In spite of this, and taking into consideration the value of recording methods for obtaining statistical relationships, the role of individual analysis will remain unchallenged in future. This is primarily due to the fact that the development of a reliable recording method is far more expensive than individual analysis. Therefore, and because of the greater instrumentation requirements, recording instruments will be used only for the most important duties. (Author summary)##

02673

H. Fuhrmann

RECORDING MEASUREMENTS OF GASEOUS IMISSION CONCENTRATIONS WITH A NEW ANALYZER. Staub (English Translation) 25, (7) 19-24, JULY 1965.
CFSTI TT 66-51040/7

For monitoring gases contributing to air pollution, SO2 and NO plus NO2 and O3 in particular, recording analysers find increasing application. The paper describes an automatic colorimetric analyser for the repetitive measurement of immission concentrations. The instrument is characterized by high sensitivity down to a few micrograms cu m, excellent selectivity, and minimum maintenance requirements. Simple switchover means permit the same instrument to be used for both half-hour mean values and short-time readings. The Incometer described by the author is designed for simple and rapid change-over to various gaseous compoenents. It has been fieldtested in a northern suburb of Hamburg. The recorded daily readings for SO2, NO plus NO2, and O3 are discussed. (Author summary)##

02681

E. Lahmann

METHODS FOR MEASURING GASEOUS AIR POLLUTIONS. Staub (English TRANSIATION) 25, (9) 17-22, SEPT. 1965.
CFSTI TT 66-51040/9

As the analysis of air pollutants has become a very extensive area of microchemistry, the statements included herein are limited to the principles involved in the analysis of the most important extraneous gases. Empirical, batch and continuous methods are the basic means for investigating gaseous air pollutants. The advantages and disadvantages of these methods are presented. Subsequently, the most important methods used at present for determination of sulfur dioxide, nitrogen dioxide, hydrogen sulfide, fluorides, oxidants, carbon monoxide and hydrocarbons are discussed.##

02732

I. R. Cohen, T. C. Purcell, and A. P. Altshuller

ANALYSIS OF THE OXIDANT IN PHOTOOXIDATION REACTIONS. Environ. Sci. Technol. 1, (3) 247-52, Mar. 1967. (Presented at the 152nd Meeting, American Chemical Society, New York City, Sept. 14, 1966.)

A number of methods for determining the identity and concentration of the oxidants produced photochemically in model systems are presented. The application of these methods to atmospheric sampling is discussed. The effects of the following variables are considered: spectral characteristics of the reagent blends and the colored species in question; temperature; order of addition, color stability and rate of color formation; reagent concentration; hydrogen ion concentration (pH); and various determinate errors. Calibration curves, molar absorptivities, and interferences are presented in detail. (Author abstract)##

02745

S. Hochheiser and W. J. Basbagill

COMPARISON AMONG METHODS OF SAMPLING AND ANALYZING AIR POLLUTANTS - DESIGN OF EXPERIMENTAL PROGRAM. Preprint. (Presented at the Sixth Conference of Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Jan. 6-7, 1964.)

A mobile air-sampling laboratory used to sample atmospheric pollutants is described. Various manual and automatic methods are compared by means of atmospheric samples to determine the relationship among methods and the variables that may affect each method. These studies were designed to evaluate methods applied

to the sampling and analysis of air pollutants and to determine the need for further laboratory and field evaluations. The chemical and meteorological variables measured in these studies and the sampling program are delineated. (Author summary)##

02747

W. J. Jacumin and L. A. Ripperton

FURTHER EFFECTS OF TEMPERATURE AND PRESSURE ON PHOTOCHEMICAL OXIDANT PRODUCTION. J. Air Pollution Control Assoc. 14, (3) 96-7, Mar. 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-101.)

Oxidant production was observed for a photochemical reactant system NO2 plus hexene-1 over a pressure range of 640 to 860 mm Hg at temperatures of 14, 25, and 35 C. An apparent inhibition took place around 714 mm at all temperatures. From a low at 714 oxidants values rose to a secondary peak at 700 mm and then dropped with decreasing pressure. The significance of these results is discussed. (Author abstract)##

02760

T.C. Purcell I.C. Cohen

MICRODETERMINATION OF PEROXIDES BY KINETIC COLORIMETRY. Environ. Sci. Technol. 1, (5) 431-3, May 1967. (Presented in part at the 152nd Meeting, American Chemical Society, New York City, Sept. 14, 1966.)

Ferrous thiocyanate, neutral potassium iodide, and molybdate-catalyzed potassium iodide reagents were used for the analysis of microgram quantities of a variety of peroxidic compounds by kinetic colorimetry. Ozone and peracetic acid gave an immediate maximum color development with all three reagents. Hydrogen peroxide gave slow color development with neutral KI only. Acetyl peroxide, nitrogen dioxide, alkyl hydroperoxides, and peroxyacyl nitrates gave slow color development with all three reagents. The half lives of these colorimetric reactions were used to identify specific oxidants. (Author abstract)##

02763

G.A. Rost E.J. Swartz

ADVANCES IN CONTINUOUS AIR POLLUTION ANALYZERS. Preprint. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, Paper No. 63-9.)

The evolution of air pollution instrumentation by size has been reviewed. The analysis methods in general usage and

information on the specific instrumentation involved show that a steady decrease in analyzer size has occurred with negligible loss in sensitivity or specificity. The cost of the nonportable laboratory analyzers has been high; as a result, cities and communities are in general unable to afford this equipment. Smaller or semi-portable instruments are less costly and provide versatility to the users. Now that electrochemical monitors are available for the analysis of one or two pollutants, conjecture about the future of complete air sampling systems is of interest. Although these monitors have not been applied to the analysis of all air pollutants, it is anticipated that within reasonable lengths of time sufficiently sensitive and selective methods will be developed. This, in turn, means that it would be possible to have an entire air sampling station consisting of five or six analyzers on a single table top. These units would require only minor accessories to be completely portable. In addition, with the inherent simplicity of electrochemical analyzers, the cost per instrument will be lower, thus more monitoring networks can be operated per available dollar, and the technician skill required to operate the equipment can be minimized. Tables and illustrations.##

02786

P. H. Linnell and W. E. Scott

DIESEL EXHAUST COMPOSITION AND ODOR STUDIES. J. Air Pollution Control Assoc. 12, (11) 10-5, Nov. 1962.

Some of the techniques being used and evaluated for exhaust analysis are outlined. Results except for some qualitative and tentative findings are shown in tables 1-8. Most values are averages of 2 or 3 determinations. These determinations were made on new samples taken at different times, with intervals of several weeks elapsing in some cases. Particulate matter information in table 1 indicates organic compounds adsorption. This is of interest in eye irritation and odor work since aldehydes may be present on particulate matter in higher concentrations than are present in the gas phase. The CCl4 extracts of particulate matter show infrared bands characteristic of hydrocarbons, olefins, aldehydes, and carbonyl. Comparison of hydrocarbon measurements, formaldehyde and acrolein, and miscellaneous compounds are discussed. 26 references.##

02799

E. Sawicki and J. L. Noe

A SENSITIVE NEW METHOD FOR THE DETERMINATION OF NITRITES AND NITROGEN DIOXIDE WITH 4-AMINOAZOBENZENE-1-NAPHTHYLAMINE. Anal. Chim. Acta 25, 166-9, 1961.

A sensitive method for the determination of nitrites is introduced. The method should also be applicable to the determination of nitrogen dioxide. The test consists of the reaction of 4-aminoazobenzene and 1-naphthylamine with nitrous

acid to form the blue dication of 4-(p-phenylazophenylazo)-1-naphthylamine. Beer's Law was obeyed from 0.5 to over 15 micrograms of nitrite ion per 15 ml of final solution. Spectrophotometrically it is possible to detect part of nitrite ion in 60 million parts of solution. (Author summary)**

02841

K. T. Whitby, R. C. Jordan, and C. M. Peterson

GENERATION AND DECAY OF SMALL IONS (DEVELOPMENT OF A PARTICLE COUNTER SYSTEM AND DEVELOPMENT OF A TECHNIQUE FOR STUDYING THE CHARGE OF AN EVAPORATING DROP). Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering. 49 pp. June 1, 1964

Design, construction, and initial evaluation of an electrical particle counter system capable of rapid, in situ, measurement of aerosol concentration and particle size distribution over the range from 0.015 to 2 micron is described. Initial measurements of natural laboratory aerosols show satisfactory agreement with the Royco optical particle counter in the size range where they overlap. Simultaneous operation of an automatic condensation nuclea counter, the electric particle counter and the Royco counter permit rapid measurement of aerosol size distribution from molecular to 10 micron. The two key elements of the new system are a special sonic jet diffusion charger and a new mobility analyzer. The charger uses aerosol recirculation which makes it possible to charge a high fraction of small particles with a low Nt while maintaining a mobility minimum at about 3 micron. The mobility analyzer utilizes a region where an electric precipitating field exists followed by a current collector to obtain high resolution, mobility measurements down to 0.0002 cm/sec per volt/cm with a 1 cfm aerosol flow rate. Technique and apparatus are also described for the study of electric charge on evaporating droplets smaller than 50 microns. (Author abstract)**

02845

M. D. Thomas and R. E. Amtower

GAS DILUTION APPARATUS FOR PREPARING REPRODUCIBLE DYNAMIC GAS MIXTURES IN ANY DESIRED CONCENTRATION AND COMPLEXITY. J. Air Pollution Control Assoc. 16, (11) 618-23, Nov. 1966

The development and testing of analytical methods for determining gaseous air pollutants would be expedited by the availability of known gas mixtures, reproducibly prepared in any desired quantity, complexity, and concentration. A portable gas dilution apparatus was constructed by which reproducible known mixtures of the common air pollutants added to carbon filtered air can be prepared. Sulfur dioxide mixtures with and without the addition of nitrogen dioxide and/or ozone have been analyzed by the conductimetric, titrimetric, turbimetric, and colorimetric methods. Excellent analytical agreement with the concentration obtained from the volumes of SO2, NO2, hydrogen sulfide, and air that are mixed

has been shown by all these methods when an efficient absorber is used although the titrimetric method tended to give slightly lower results.##

C2852

G.A. Persson

AUTOMATIC COLORIMETRIC DETERMINATION OF LOW CONCENTRATION OF SULPHATE FOR MEASURING SULPHUR DIOXIDE IN AMBIENT AIR.
Intern. J. Air Water Pollution 10, (11-12) 845-52, Dec. 1966.

An automatic colorimetric method for the determination of low concentration of sulphate (0-10 microgram/ml) using the Thoron indicator is described. Total amounts of sulphate as small as 0.3 microgram can be determined. The sulphate is precipitated with barium perchlorate and the excess of barium is indicated with 1-(0-arsenophenylazo)-2-naphthol-3.6-disulfonic acid (Thoron). The procedure is worked out primarily for the determination of sulphur dioxide in air after absorption in diluted hydrogen peroxide. The equipment used is the Technicon Auto-Analyzer.##

C2874L

T.M. Downer, Jr. C.R. Riber, Jr.

THE DETERMINATION OF SULFUR IN ORGANIC COMPOUNDS. Cincinnati Univ., Ohio May 1966. 12pp.
DDC AD 486815

A rapid method for the determination of sulfur is described. The method is applicable to the sulfate ion formed following an oxygen flask corbustion procedure. The percentage of sulfur is determined by titrating the sulfate ion with barium perchlorate using a complexing indicator, Thorin, to detect the end-point. Compounds containing carbon, hydrogen, nitrogen, chlorine and sulfur were successfully analyzed.##

02883L

M. N. Hirsh, P. N. Eisner, G. M. Halpern, and J. A. Slevin

IONIZATION AND ELECTRON LOSS SIMULATION IN ATMOSPHERIC GASES (QUARTERLY REPT. NO. 2, SEPT. 1 - NOV. 30, 1965. Dewey (G.C.) Corp., New York City. Mar. 1966. 27 pp.
DDC AD 486307

This report covers work performed during the period 1 September through 30 November 1965. The report begins with a description of experimental modifications made to the mass spectrometer to increase its utility as a quantitative instrument. The theoretical work, including both a summary of current work on the

numerical computation of the low pressure oxygen model, and some studies of the chemistry resulting from the addition of a trace of nitrogen to the low-pressure oxygen plasma, are presented.##

02921

F. E. Gartrell, F. W. Thomas, and S. B. Carpenter

ATMOSPHERIC OXIDATION OF SO2 IN COAL-BURNING POWER PLANT PLUMES . Am. Ind. Hyg. Assoc. J. 24, 113-20, Apr. 1963. (Presented at the 23rd Annual Meeting, American Industrial Hygiene Association, Washington, D.C., May 1962.)

Sampling equipment and procedures applicable for use in a helicopter were devised for collecting the separate SO2 and SO3 components in progressive plume cross sections at a large coal-burning power plant. Samples were collected during a variety of meteorological conditions with particular attention to a wide range of relative humidity. During periods of low humidity, data reveal that oxidation of SO2 is relatively slow, increasing from 2% at one mile (12 min) to 3% at 6 miles (60 min). With moderately high humidity, oxidation was initially rapid, 22% at one mile (12 min), increasing to 32% at 8 miles (96 min). The highest total oxidation, 55%, was observed in a slight mist at 9 miles (108 min). (Author abstract)##

02961

R. F. Pueschel and A. T. Rossano, Jr.

THE PROBLEM OF REDUCED VISIBILITY FROM AIR POLLUTION. Proc. Ann. Sanitary Water Resources Eng. Conf., Vanderbilt Univ., Nashville, Tenn., 1965. pp. 208-25.

The concepts relating atmospheric visibility with extinction of light by aerocolloidal matter are presented. A newly developed spectrophotometer for extinction measurements is described. The instrument has been applied to determine the scattering properties of fine particles and the resulting reduction of the visual range. The results can be summarized as follows: (1) The prevailing visual range is inversely proportional to the number concentration of the existing aerosol. (2) The dependence of the visual range on the wavelength of light at constant number concentration varies in a rather complicated pattern, depending on the size of the particles. (3) The relationship between the visual range and the size of the particulates, assuming that their mass concentration is constant, shows that particles of the diameter of about 0.00004 cm have the most restricting effect on visibility. (4) At a constant number concentration the visual range decreases as the particles increase in size. Comparisons between experimental results and Mie theory calculations do not agree for all values of the size parameter. The tests showed the reliability of the experimental apparatus and procedure. (Author summary modified)##

02987

E. Lahmann and K. E. Prescher

INTERMITTENT DETERMINATION OF H2S IN THE ATMOSPHERE. Staub (English Transl.) 25, (12) 3-5, Dec. 1965.
CFSTI TT66-51040/12

It is shown as an essential result of batch determination of H2S in air, that the light penetration properties of cadmium sulphide suspensions occurring during sampling vary considerably. Comparative measurements carried out with samples protected and unprotected against light have shown disparities between the results amounting to ratios higher than 10:1. (Author summary)**

03010

H. Devorkin, R.L. Chass, A.P. Fudurich, C.V. Kanter

SOURCE TESTING MANUAL. Los Angeles County Air Pollution Control District, Calif. 181 pp., Nov. 1965

Specialized methods and techniques for the curtailment of contaminants being released into the atmosphere, developed in the laboratory and in the field are described in this manual. These methods are concerned primarily with the measurement of emissions from stationary sources, and in general, with little or no modification, these methods can also be used for testing vehicles or other moving sources. Information obtained form source tests is invaluable as a guide in selecting appropriate control equipment and improving the design of future installations to minimize the discharge of air contaminants. Following topics are discussed: Planning a source test; Determination of gas flow rate; Collection and analysis of particulate matter, and of gaseous constituents; Odor measurement; Source test report. The appendixes deal with rules and regulations, conversion factors and constants, and auxiliary field sampling equipment.**

03011

G. Resor, III

MEASUREMENT OF ATMOSPHERIC EXTINCTION AND LIGHT SCATTERING FUNCTION: PART I. POLAR NEPHELOMETER AND POWER SUPPLY (FINAL REPT.) Elcon Lab., Inc., Salem, Mass. (Rept. No. R-3-66-2.) 102 pp., July 1966.

An ultraviolet polar nephelometer which is used to measure the differential scatter function of air is described. The instrument covers the range from pure air to dense haze conditions. A comprehensive discussion is given of the design of the instrument, and the optical and electrical components,

installation procedures, and maintenance guid are described in detail. The nephelometer has a useful, dynamic range of 60 db. adjusted so that adequate signal is obtained for pure air. Detailed specifications are listed in Section 5. (Author abstract modified)##

03091

E.W. Hewson

METEOROLOGICAL INSTRUMENTS FOR AIR POLLUTION SURVEYS (INFORMATIVE REPORT NO. 1). J. Air Pollution Control Assoc. 15, (6) 278-80, June 1965

This report is directed toward those concerned with air pollution surveys, and to provide guidance for persons not well acquainted with meteorological measurements. The following basic air pollution meteorological instruments and topics are discussed: Wind measurement instruments, temperature, stability and precipitation measurement, type of sensor, calibration, solar radiation and barometric pressure. Records, data handling and analysis of data are also outlined.##

03096

N.A. Lyshkow

A RAPID AND SENSITIVE COLORIMETRIC REAGENT FOR NITROGEN DIOXIDE IN AIR. J. Air Pollution Control Assoc. 15, (10) 481-4, Oct. 1965 (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965)

High speed instrumentation requires a colorimetric reagent capable of detecting traces of nitrogen dioxide with little delay for color development. Rate of color development and sensitivity of Griess-type reagent have been improved by adding a promoter (R-salt) and optimizing the concentrations of diazotizing and coupling reagents. Field tests show that the new instrument -reagent combination can resolve short-duration peaks in NOi concentrations of 5 to 10 ppms. (Author abstract)##

03099

I. Pierce, Y. Tokiwa, K. Nishikawa

EVALUATION OF CONTACT COLUMNS FOR NITROGEN DIOXIDE ABSORPTION. J. Air Pollution Control Assoc. 15, (5) 204-6, May 1965 (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

The absorption efficiencies of six, 10-, 13-, and 60-turn spiral columns were studied using half-strength and modified

Saltzman reagents. The 60-turn column was 100% efficient at all air and liquid flow rates using half-strength Saltzman reagent. The 13-turn column was 100% efficient at an air flow rate of 290 ml/min using half-strength Saltzman reagent and at both 290 and 500 ml/,in using modified Saltzman reagent. The results of the study have led to the adoption of 13-turn spiral contact columns together with the use of modified Saltzman reagent for all State operated NO2 monitoring instruments. (Author summary)##

C3100

L. Potter S. Duckworth

FIELD EXPERIENCE WITH THE MAST OZONE RECORDER. J. Air Pollution Control Assoc. 15, (5) 207-9, May 1965 (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

The practical necessity for continuous air monitoring by an instrument network is explained. Network criteria are listed. A coulometric monitoring system for oxidants is described and evaluated. Operating method, calibration techniques, costs, and comparative field data are given. The authors conclude the coulometric system is feasible for operation on a widespread basis. Attractive features include: portability; remote recording; easy installation; centralized, coincident calibration of several monitors; linear data output; data consistent with other systems; and a potential for mobile use in horizontal and vertical surveys of the atmosphere. (Author abstract)##

03103

J. Harkins S.W. Nicksic

STUDIES ON THE ROLE OF SULFUR DIOXIDE IN VISIBILITY REDUCTION. J. Air Pollution Control Assoc. 15, (5) 218-21, May 1965.

Highly sensitive radiotracer techniques were used to see if the sulfuric acid mist from sulfur dioxide oxidation allows the incorporation of organic matter. Tagged organic compounds were irradiated with and without sulfur dioxide. When the aerosol was filtered off, no radioactivity was found on the filter paper showing the absence of organic matter and the lack of sulfur dioxide synergism. (Author abstract)##

C3112

E.R. Stephens M.A. Price

A SEARCH FOR SOME NITRO-OLEFINS IN POLLUTED AIR. J. Air Pollution Control Assoc. 15, (7) 320-2, July 1965.

An electron capture chromatographic method of detecting nitroethylene and 1-nitro-1 propene was developed and applied to ambient air samples, photolyzed propene/nitrogen dioxide mixtures and auto exhaust. No trace of either compound was found in ambient air or in the photolyzed mixtures. The detection limit was estimated to be 1 ppb. A single sample of auto exhaust showed several small peaks which, if attributed to nitro-olefin, would amount to insignificant traces. (Author abstract)##

03159

J. J. Kelley, Jr. and D. F. Weaver

CARBONDIOXIDE AND OZONE IN THE ARCTIC ATMOSPHERE. Proc. Alaska Sci. Conf., 16th, 1966. pp. 151-68.
CFSTI,DDC AD 638035

Atmospheric carbon dioxide and ozone were continuously monitored at the North Meadow Lake field station of the Arctic Research Laboratory near Barrow, Alaska beginning in January, 1965. Atmospheric carbon dioxide measurements were resumed after a fifteen month lapse resulting from the interruption of an earlier program by a severe storm in October, 1963. The continuous observation of ozone near the ground was added to the general micrometeorological and microclimatological studies at North meteorological phenomena.##
Meadow Lake to determine the concentrations and fluctuations of ozone in the Arctic atmosphere and its relation to other

03205

D. Epstein.

DETECTION AND PREVENTION OF AIR POLLUTION IN THE USSR.
Detection et prevention de la pollution atmospherique en U.R.S.S. Pollut. Atmos. (Paris) 8, (31) 273-83, Sept. 1966.

The problems of the toxic amounts of air pollutants (CO, SO2, H2SO4, NO, and 3, 4-benzopyrene) are described and the criteria for standardization in Russia given. The methods for detecting toxic proportions of these pollutants are given in detail, the techniques used for animal experimentation, and studies of the tests applicable to mankind and the techniques of applying them are described in particular. The paper mentions that since chronaxie was judged insufficiently sensitive, the Soviet authors resorted to electroencephalographic methods which reveal an electrocortical reflex for small amounts of polluting agents. These tests involving instantaneous maximum admissible concentration are supplemented by statistically analyzed experiments on animals. (Author summary)##

03218

J. Krizek.

DETERMINATION OF NITROGEN OXIDES IN SMALL CONCENTRATIONS. (Stanoveni nizkych koncentraci kyslicniku.) Chem Prumysl (Prague) 16, (9) 558-9, 1966. Czech. (Tr.) (Translated as JPRS-R-8583-D.)

The author revises the polarcgraphic and colorimetric method for determining nitrogen oxides. He finds that improper composition of the absorption solution is responsible for the biased (systematically lower) experimental results; potassium nitrite, formed if the gas is absorbed in 0.1N KOH solution containing H2O2, decomposes in acid medium during further operations. He therefore recommends using the H2O2 solution for absorption with subsequent alkalization before the sample is boiled down. He discusses the applicability and suitability of methods for determining NO2 which utilize the formation of azo dyes.##

03234

F. S. Tipson, A. Cohen, and A. J. Fatiadi

AIR POLLUTION STUDIES. National Bureau of Standards, Washington, D.C. (NBS Technical Note 405) 1-28, 1966

The oxidation of polycyclic aromatic hydrocarbons is described. Results are reported for the oxidation of naphthalene, anthracene, phenthrene, pyrene, and perylene with a variety of oxidants. Oxidation products are identified where possible. The results obtained with periodic acid as an oxidant are particularly noteworthy. Studies of photooxidation of the polycyclic hydrocarbons on silica gel, alumina, soil, and air-borne particulate matter have revealed, for each hydrocarbon, products that may arise in contaminated air under smog conditions. (Author abstract)##

03245

S. Yanagisawa, N. Yamate, S. Smitsuzawa, and M. Mori

CONTINUOUS DETERMINATION OF NITRIC OXIDE AND NITROGEN DIOXIDE IN THE ATMOSPHERE. Bull. Chem. Soc. Japan (Tokyo) 39, (10) 2173-8, OCT. 1966

Continuous determinations of nitric oxide and nitrogen dioxide in the atmospheric air by the use of modified Saltzman reagent is described. Measurement was made intermittenly, once every 30 min., by an automatic continuous analyzer equipped with a single-path colorimeter. The response of the analyzer was obtained as an average of the concentration of nitrogen oxides over a period of 25 min. Two bubblers were used for absorbing nitrogen oxides into the modified Saltzman reagent, whose

transmittance was measured for the determination: One bubbler was designated to obsorb nitrogen dioxide, and the other, nitric oxide plus nitrogen dioxide after the cxidation of the nitric oxide by permanganate. The oxidizing efficiency of the permanganate was 96-100 per cent. The acetic acid in the Saltzman reagent was replaced with n-propyl alcohol in the modified Saltzman reagent; the spontaneous coloration and corrosive quality of the reagent was decreased by this substitution. The concentration of nitric oxide was obtained from the difference between the two responsed of the analyzer, while the concentration of nitrogen dioxide could be read directly from the recorder. The transmittance ratio method was applied to the measurements. Accurate determinations were possible even at high blank values. The reagent was used repeatedly by cycling it on the basis of measuring the difference in coloration before and after the absorption of nitrogen oxides. The analyzer could be used for a long period without changing the reagent. (Author summary)##

03295

Y. Tokiwa, B. R. Tamplin, and J. A. Nadel.

MONITORING HUMAN EXPOSURES TO SULFUR DIOXIDE IN A BODY PLETHYSMOGRAPH. J. Air Pcllutien Control Assoc. 15, (3) 96-8, Mar. 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

We have demonstrated a method by which one can produce an SO2 contaminated atmosphere, expose man to this atmosphere while maintaining the SO2 concentratien at a given level, and measure the concentratien with less than a one minute lag time. Safety of the subject is assured. The body plethysmograph can be used simultaneously as a pulmonary function measuring device and as an exposure chamber.##

03296

R. E. Weg and L. G. Wayne.

AUTOMATIC ANALYSES OF CERTAIN ENZYMES OF SMOG EXPOSED ANIMALS. Preprint. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

The work reported in this paper is part of an extensive investigation into the effects of Los Angeles air pollution on laboratory animals. Assays described include the enzyme activities of the sera and tissues of rabbits, rats, guinea pigs, and chicks. These studies were initiated to examine the effects of continuous exposure to the relatively low concentration of irritants in the Los Angeles smog. In progress are studies of assay procedures for any other possible pollutant-sensitive substance of the living organism. The effect of psycholcgical stress on enzyme activities, either alone or together with smog exposure is being measured as part of the experimental protocol.##

03350

E. Langberg

MEASUREMENT OF ATMOSPHERIC EXTINCTION AND LIGHT SCATTERING FUNCTION. Part II. Apparatus for Measurement of Atmospheric Extinction (Final rept.). Elcon Lab., Inc., Salem, Mass. (Rept. No. R-5-66-1) 82 pp., July 1966
CFSTI, DDC 637 796

The objective was to build and test an ultraviolet polar nephelometer and extinction meter. The nephelometer is capable of automatically measuring the angular scattering function of air at 4 wavelength regions for conditions ranging from pure air to dense haze. The extinction meter is capable of automatically measuring the extinction coefficient of air at one wavelength for conditions ranging from pure air to dense haze conditions. Both systems are self-calibrating so that only a minimum of periodical calibrating is necessary.##

03402

03402
M. Fossard, R. G. Rinker, W. H. Corcoran

DETERMINATION OF SMALL QUANTITIES OF NITRIC OXIDE AND NITROGEN DIOXIDE IN NITROGEN BY GAS CHROMATOGRAPHY. Am. Soc. Testing Mater., Spec. Tech. Publ. 352, 56-9 pp., Dec. 1963.
(Presented at the Symposium on Air-Pollution Measurement Methods, Los Angeles, Calif., Oct. 5, 1962.)

Studies were made on the determination of nitric oxide (NO) and nitrogen dioxide (NO_2) present at less than 5000 ppm by volume in nitrogen. The work was a continuation of previous studies on the quantitative analysis of small amounts of nitric oxide in nitrogen by gas chromatography using a silica gel column. The nature of the results suggests that NO and NO_2 are irreversibly adsorbed in small quantities on silica gel. This strong adsorption, separate from a physical or van der Waals adsorption, forms a basis for separation of small amounts of NO and NO_2 subsequent to an initial conditioning of the silica gel with these oxides of nitrogen (N_2). (Author abstract)##

03425

S. P. Smith and R. J. Grant.

A NON-SELECTIVE COLLECTOR FOR SAMPLING GASEOUS AIR POLLUTANTS FINAL REPT.) Pittsburgh Coke and Chemical Co., Research and Development Dept. Dec. 15, 1958. 63 pp.

Tests of the retentive power of various adsorbents indicated activated carbon is superior to silica gel and molecular sieves for

the non-selective collection of air pollutant gases. When dry ice is used as a refrigerant on a carbon column it is possible to collect methane and all gases of lower volatility in a sample of reasonable size. Certain oxidizing gases such as No, NO2 and O3 appear to react with activated carbon and must be considered separately. Columns of various sizes were tested over a wide range of gas concentrations and a column containing 55 grams of Pittsburgh HDL activated carbon chosen to sample 20 liters of air for light contaminants. A smaller column for operation at room temperature containing 1.5 grams of the same carbon may be used ahead of the refrigerated column to collect C4 and higher compounds from 100 liters of air. A field collector kit was designed which affords a preliminary filtration and drying of the air sample, positive displacement measurement of the sample volume, continuous flow measurement and mechanical pumping of the air sample. A helium flushing system for the refrigerated collector is also provided to remove the bulk of air adsorbed from the sample. Prototype columns were tested satisfactorily for retention under exaggerated test conditions on selected hydrocarbon vapors. A few recovery runs indicated that good recovery can be confidently expected after further experimental development of recovery techniques. (Author summary)##

03449

Farmer, J. R. and J. D. Williams

INTERSTATE AIR POLLUTION STUDY PHASE II PROJECT REPORT. III. AIR QUALITY MEASUREMENTS. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 182p., Dec. 1966. 71 refs.

The development of an effective air resource management program begins with the determination of what pollutants are in the air, the quantity of each, and where they originate. The aerometric network was designed and operated to determine the nature and extent of air pollution in the Metropolitan St. Louis area. Once the air pollution problem is defined, the emission inventory and the opinion surveys can be used in connection with air quality criteria to set the air quality goals. Then the aerometric network will be used to monitor the air to insure the goals are attained. The salient portions of this report are the tabular data on particulates, gaseous pollutants, and material deterioration.##

03474

K. M. Brown and W. C. McCrone

DISPERSION STAINING. PART I - THEORY, METHOD AND APPARATUS. Microscope Crystal Front 13, (11), Apr. 1963.

Dispersion staining, an optical method of imparting a colour to transparent substances, has been applied empirically in the past to a variety of identification problems particularly in the

industrial hygiene field. An excellent paper by Cherkasov has shown how to proceed to make visible, reproducible and strong colours and Schmidt has suggested how a systematic scheme for identification might be set up. The present paper attempts to summarise the theory, equipment, and applications as already published in the literature and then to present new material for the systematic identification of transparent substances. (Author abstra 3)##

03520

R. I. Larsen

PARAMETERS OF AEROMETRIC MEASUREMENTS FOR AIR POLLUTION RESEARCH. Am. Ind. Hyg. Assoc. J. 22,(2) 97-101, Apr. 1961.

A brief description of a continuous gas sampling network is presented in which a number of air pollutants is to be measured in six United States cities beginning about mid 1961. Parameters are presented of aerometric measurements from a two year study of sulfur dioxide in Louisville, Kentucky, to be related to health and other effects. Six equations are developed to depict the frequency, duration, and air pollution dosage. (Author abstract)##

03527

P. O. McCaldin

EVALUATING AIR POLLUTION PROBLEMS (ACCEPTABLE EQUIPMENT AND PROCEDURES). Arch. Environ. Health 2, 228-33, Mar. 1961.

Some of the more common equipment used in making environmental air quality determination, such as Hi-Volume Samplers, Filter Tape Samplers, Gas Samplers, and simplified monitoring techniques, are discussed. Hi-Volume Samplers are frequently used to measure suspended particulate which may consist of smoke, dust, or other solids small enough to remain air-borne for long periods. This includes particulates under 100 microns in diam, and, for the most part, those less than 1 micron in diam. Fiber glass filters commonly used with this sampler collect practically all particulates down to 0.3 micron in diam. The sampler itself consists of a vacuum cleaner motor with mounting to accomodate an 8-in by 10-in filter. Filter Tape Samplers are commonly used in the field studies and usually are equipped with a diaphragm pump to draw air through at a rate of about 7 liters/min. Various automatic instruments are used for the continous collection and recording of gaseous pollutants. However, various manual or semimanually operated bubbler collection trains have been used in the majority of gaseous measurements. Simplified monitoring techniques are discussed in conjunction with dustfall sulfation rates, H_2S, corrosion and fluoride sampling.##

03537

T. R. Hauser, D. W. Bradley

EFFECT OF INTERFERING SUBSTANCES AND PROLONGED SAMPLING ON THE 1,2-DI-(4-PYRIDYL)ETHYLENE METHOD FOR DETERMINATION OF OZONE IN AIR. Anal. Chem., 39(10):1184-1186, Aug. 1967. 4 refs. (Presented at the Division of Water, Air, and Waste Chemistry, 153rd Meeting, ACS, Miami Beach, Fla., April 1967.)

A new method for the sampling and analysis of ozone in the atmosphere involves the collection of atmospheric ozone in a solution of 1,2-di-(4-pyridyl)ethylene (PE) in glacial acetic acid, reaction of the ozone with the PE via the ozonolysis reaction to form pyridine-4-aldehyde, and colorimetric analysis of the resultant pyridine-4-aldehyde using a modification of the 3-methyl-2-benzothiazolone hydrazone method. This paper describes the effect of two additional analytical parameters on the PE method. These parameters, namely the effedt of possible interfering substances present in the atmosphere and the effect of prolonged sampling time on final analysis, are very important when any analytical procedure is applied to the field analysis of atmospheric contaminants. The results demonstrate that the method can be used for 24-hr. sampling simply by increasing the volume of absorbing solution since there is no loss of collected ozone from the absorbing solution during a 24 hr. sampling period due to a possible aeration effect.##

03542L

L. Reckner, F. R. Taylor, W. E. Scott, H. J. Wimette

DIESEL EXHAUST COMPOSITION, ODOR AND EYE IRRITATION (PROGRESS REPORT MAY 1, 1962 TO FEB 15, 1963. Preprint 1963.

Further work with the two-cycle 6-cylinder V-type diesel engine is reported which which covers solid and liquid particulate emissions at various operating conditions, odor intensity and eye irritation observations by a human panel at three operating conditions, analyses of the particulate for polycyclic aromatic hydrocarbons and further analyses of the gaseous emissions by long-path infrared and colorimetric techniques. A number of polycyclic aromatic hydrocarbons, including benzo(a)pyrene and several other compounds with reported positive biological activity, have been detected in diesel exhaust by fluorescence spectroscopy. The concentrations of most polycyclics were highest from 1/2 load to 7/8 load with a sharp decrease from 7/8 load to full load. The benzo(a)pyrene concentrations found in diesel exhaust (0.6 to 7.4 micrograms per cubic meter) were lower than the 8.5 micrograms per cubic meter recently reported for automobile exhaust, but the diesel produced more benzo(a)pyrene (0.15 to 1.3 milligrams) per gallon of fuel than the automobile (0.27 milligrams). Fluorescence analyses of new and used lubricating oil and the rate of oil consumption indicate

that the contribution of the oil to the exhaust particulate of this engine is negligible. Values for the emissions of nitrogen dioxide have been revised downward as a result of using an improved sampling technique which minimizes the oxidation of nitric oxide to nitrogen dioxide. Of the three engine operating modes studied, the odor intensities and eye irritation observed by the human panel were lowest at the 1200 RPM-1/4 load condition. It is believed at this time that the eye irritation from the exhaust can be accounted for by the formaldehyde and acrolein found in the exhaust. There is no clear-cut correlation, however, between the concentrations of these aldehydes and the odor differences observed.##

03544

B. E. Saltzman N. Gilbert

MICRODETERMINATION OF OZONE IN SMOG MIXTURES (NITROGEN DIOXIDE EQUIVALENT METHOD). Am. Ind. Hyg. Assoc. J. 20, 379-86, Oct. 1959.

A new method has been presented for conveniently and specifically determining low concentrations of ozone in polluted air, even in the presence of large amounts of other commonly occurring oxidizing or reducing gases. Ozone was stoichiometrically converted to (and determined as) nitrogen dioxide, by addition of controlled amounts of gaseous nitric oxide to the sample air stream and allowing a short reaction flow time. Better than 95% conversion was obtained in a convenient apparatus which was developed, when 1 p.p.m. excess nitric oxide and forty seconds reaction time were used. In the short time allowed, oxidation of nitric oxide by air and organic oxidant was negligible. Results for pure ozone were in good agreement with those of an iodide reagent. For synthetic smog oxidant mixtures (generated by the ozone reaction with 1-hexene) the method appeared specific for ozone, whereas the iodide reagent also responded to organic oxidants. (Thus the mixture could be differentiated into two oxidant components by simultaneous application of the two methods.) Reducing gases such as sulfur dioxide and hydrogen sulfide did not appreciably interfere even in one hundred to one ratio to ozone. The method should make possible interesting new data for polluted air. It should be readily adaptable to automatic recording of ozone in smog without interference from associated pollutants. (Author summary)##

03621

03621

M. D. Thomas, J. A. MacLeod, R. C. Robbins, R. C. Goettleman, R. W. Elridge, L. H. Rogers

AUTOMATIC APPARATUS FOR DETERMINATION OF NITRIC OXIDE AND NITROGEN DIOXIDE IN THE ATMOSPHERE. Anal. Chem. 28, 1810-6, Dec. 1965. (Presented in part, Division of Analytical Chemistry, Symposium on Air Pollution, 130th Meeting,

American Chemical Society, Atlantic City, N.J., Sept. 1956.)

Nitric oxide and nitrogen dioxide in the atmosphere can be determined continuously with automatic sampling and recording apparatus. Two special absorbers are employed for absorption of nitrogen dioxide in a modified Griess reagent followed by colorimetric recording. One absorber measures the nitrogen dioxide alone; the other measures nitrogen dioxide plus nitric oxide after the latter has been oxidized by ozone, permanganate, or chlorine dioxide. Concentration limits of the instrument range up to about 1 p.p.m., but they can be considerably extended or reduced. Standard error is about plus or minus 5%. (Author abst*act)##

03679

A. P. Altshuller and I. R. Cohen

SPECTROPHOTOMETRIC METHODS FOR OLEFINS (COLORIMETRIC DETERMINATION OF CONJUGATED DIOLEFINS). Anal. Chem. 32, (13) 1843-8, Dec. 1960. (Presented at the Division of Water, Sewage, and Sanitation Chemistry, Symposium on Air Pollution, 136th Meeting, American Chemical Society, Atlantic City N. J., Sept. 1959.)

In a new colorimetric method conjugated diolefins are coupled with 2-methoxyethanol-phosphoric acid solvent medium. Isoprene-type diolefins couple to form products with strong absorption near 490 millimicrons, while butadiene couples to form a product with a maximum near 405 millimicrons. The intensities of these maxima are linearly related to concentration between at least 0.3 and 30 millimicrons per ml. for isoprene-type diolefins and 20 and 200 microgram per ml. for 1,3-butadiene. A 2- to 4-hour reaction period is necessary to obtain optimum intensities. No appreciable interference occurs from paraffinic, acetylenic, simple aromatic, and most other types of olefinic hydrocarbons. Some aldehydes, ketones, and phenols interfere moderately. Isoprene has been efficiently collected and determined from dilute isoprene-air mixtures, and in several liquid mixtures containing various other hydrocarbon components, including 1,3-pentadiene, unconjugated diolefins, and various types of mono-olefins. (Author abstract)##

03680

A. P. Altshuller, D. L. Miller, and S. F. Sleva

DETERMINATION OF FORMALDEHYDE IN GAS MIXTURES BY THE CHROMOTROPIC ACID METHOD. Anal. Chem. 33, (4) 622-5, Apr. 1961. (Presented before the Division of Water and Waste Chemistry, 138th Meeting, American Chemical Society, New York City, Sept. 1960.)

The modification of the chromotropic acid method for formaldehyde proposed by West and Sen has been investigated. With only minor variations, the present study confirms the previous findings of reagent concentrations, color stability of the product, and the stability of the reagent solution. A much more detailed investigation of the possible interference of olefins, alcohols, aldehydes and ketones, aromatic hydrocarbons, phenols, and of nitrogen dioxide has been made. Nitrogen dioxide, most aldehydes and ketones, and straight-chain alcohols do not interfere significantly. The interference of olefins and aromatic hydrocarbons can be largely eliminated by the use of appropriate sampling conditions. (Author abstract)##

03690

D. F. Bender and A. W. Breidenbach

MODIFICATION OF THE PHENOLPHTHALIN METHOD FOR THE DETERMINATION OF TOTAL OXIDANTS. Anal. Chem., 35(3):417-418, Mar. 1963. (Presented at the Division of Waste and Water Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

Atmospheric oxidants can be determined by the phenolphthalin method. This method is a modification of the Kastle-Meyer technique for detecting biological oxidizing substances, copper, cyanide, and hydrogen peroxide. The phenolphthalein that is produced from the oxidation of phenolphthalin can exist in a number of pH-dependent structures. Three of these structures are shown. Samples were taken from a 10-liter glass chamber in connection with another project. An ultraviolet light inside the chamber was used to irradiate air, thereby producing high concentrations of ozone. The color which initially developed in the sampling solution, faded after approximately 30 minutes of sampling. This difficulty was investigated and a modification was developed. Additional studies were done on the stoichiometry, the possible degradation of reagent during sampling, and the absorption maximum.##

03719

A. J. Drummond and J. J. Roche

THE MEASUREMENT OF THE SPECTRAL DISTRIBUTION OF SUN AND SKY RADIATION BY THE USE OF COLORED GLASS FILTERS. Arch. Meteorol., Geophys., Bioklimatol., Ser. B 14, (3/4) 326-35, 1966.

The current techniques for carrying out spectral measurements of sun and sky radiation by means of colored glass filters are reviewed. The results are discussed of an original investigation into the occurrence of what are believed to be systematic errors in enclosed hemispherical-filter thermopile systems, employed in pyranometer design. As a result of an analysis of a large mass of solar spectral measurement material, attention was first directed

to an apparent change in instrument sensitivity, when operating conditions are continuous over long periods. In the experimental investigation a group of Eppley spectral pyranometers and pyrheliometers were used. The study was extended to include pyranometers open to natural and forced ventilation as well as hermetically sealed units. The results indicate that the corrections so far established ought to be of general application, within practical limitations, to the present Eppley design and, with some modification, to other constructions. (Author summary modified)##

03727

A. P. Altshuller, S. F. Sleva, A. F. Wartburg

SPECTROPHOTOMETRIC DETERMINATION OF OLEFINS IN CONCENTRATED SULFURIC ACID. Anal. Chem. 32, (8) 946-54, July 1960. (Presented before the Division of Water, Sewage, and Sanitation Chemistry, Symposium on Air Pollution, 136th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1959.)

A new spectrophotometric method for the determination of small quantities of olefins is based on the absorbance produced in the 300 to 310 millimicron range from their reaction with concentrated sulfuric acid. The procedure is insensitive to ethylene under all conditions studied and to propylene concentrations below 1500 p.p.m. Propyl and higher molecular weight alcohols react to form absorbing products at 300 millimicron. Some higher molecular weight aldehydes, nitrogen dioxide, and sulfur dioxide interfere moderately. The method has been applied to the analysis of a number of two component liquid mixtures and to gas mixtures containing butenes, 1-hexene, or 1-hexene-benzene in air. The experimental evidence favors carbonium ions as the absorbing species. (Author abstract)##

03772

M. Buck and H. Gies

THE MEASUREMENT OF HYDROGEN SULFIDE IN THE ATMOSPHERE (COMBINED H2S AND SO2 MEASUREMENT). STAUB (English Transl.) (Duesseldorf) 26, (9) 27-33, Sept. 1966. Ger. (Tr.)

Modification of a measurement method for hydrogen sulfide in the atmosphere was studied by considering the following parameters: (1) development of a suitable sorption system, (2) desorption and the analytical determination of hydrogen sulfide, (3) limits of detection, and (4) determination of the calibration function. It was ascertained that sorption of hydrogen sulfide, associated with silver sulfide formation, occurs in sorption tubes. Hydrogen sulfide, liberated from it by subsequent treatment with acid, is then determined by the molybdenum blue method. The detection limit lies below the detectable intensity of the hydrogen sulfide smell. Since no sulfur dioxide is absorbed in the hydrogen

sulfide sorption tube, sulfur dioxide determination can be carried out simultaneously with hydrogen sulfide using the same air sample.##

03795

C. R. Begeman and J. M. Colucci

APPARATUS FOR DETERMINING THE CONTRIBUTION OF THE AUTOMOBILE TO THE BENZENE-SOLUBLE ORGANIC MATTER IN AIR. Natl. Cancer Inst. Monograph 9,17-57 1962. (Presented at the Symposium on Analysis of Carcinogenic Air Pollutants, Cincinnati, Ohio, Aug. 29-31, 1961.)

Part I describes condensation-filtration systems for collecting particulate matter from 100 percent of the exhaust gas and blowby gas of a modern automobile gasoline engine operating in a dynamometer installation. Exhaust gas flow rates for a simulated city-driving schedule of operation are given. Extraction apparatus for the recovery of the benzene-soluble fraction is described. Part II covers the design and testing of a mobile unit for the collection of particulate matter from the atmosphere. A centrifugal fan driven by an electric motor draws air through a 30 x 24 x 11 1/2 in. "absolute" filter at the rate of 5000 cfm. A Pitot tube is utilized to measure air flow. Carbon monoxide concentration is measured continuously with a nondispersive infrared analyzer. The equipment is installed in a specially adapted Step-Van truck. (Author summary)##

03828

Pustinger, John V.

ANALYTICAL TECHNIQUES FOR IDENTIFICATION OF GAS-OFF PRODUCTS FROM CABIN MATERIALS. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th) Wright-Patterson AFB, Ohio, b8contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 276-295, Nov. 1965.
CFSTI, DDC: AD 629622

A program was initiated to identify the gas-off products from a variety of candidate space craft materials and to estimate the concentration and gas-off rates of these potential space contaminants. Eventually 50 materials will be tested and approximately 1000 analyses will be performed. A listing of general types is presented. Some standard procedures for establishing minimum detection levels are needed. The simple methods of weight loss from thermal degradation or olfactory sensing, as used in the Mercury program, will not suffice. As shown in this study, the highly sensitive detection system of gas chromatography and the specific identification possible with supporting mass spectrometry and infrared absorption spectrophotometry fulfill most criteria. The techniques employed in this program were developed for application to survey a wide

range of materials. In each material system, more optimum instrument conditions, particularly gas chromatography operation, could be established. It is felt that with improved gas chromatography techniques, considerably lower detection levels can be established. The biggest problems in standardization of methods are sample preparation and handling. There are many variables, e.g., freshness of sample, surface area, mixing, curing, sample uniformity and changes in proprietary mixes, which can influence the nature and degree of gas-off products. Early results indicate that standardization of methods for gas chromatography and mass spectrometry can best be accomplished for individual sample types, e.g., silicone polymers, rather than a single comprehensive approach. Each system produces different gas-off products, which require different analyses. Also, the most significant data can be obtained when the materials are evaluated in the approximate form for final use.**

03866

J. R. Farmer J. D. Williams

INTERSTATE AIR POLLUTION STUDY: PHASE II PROJECT REPORT. III. AIR QUALITY MEASUREMENTS. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. Dec. 1966. 190 pp.

The development of an effective air resource management program begins with identification of the pollutants in the air, and determination of the quantity and origin of each type. The air quality measurement program was designed and operated to make these determinations in the Metropolitan St. Louis area. Once the physical aspects of the air pollution problem are defined, air-pollution-effect data and criteria as well as opinion surveys can be used to set the air quality goals. From this base, with use of the pollutants emission inventory the air resource management emission control plan can be designed. At this stage the air quality measurement program is used to monitor the air quality to assure that the goals are attained. In addition ot its use in the air resource management program, this report provides a reasonably complete list of air quality data in a form that will assist research and program personnel in developing activities and attaining program objectives. A population distribution map of the study area is provided to allow comparison between distribution of population, pollutants, and sampling measurement networks.**

03888

J. H. Talbot

A DIFFRACTION SIZE-FREQUENCY ANALYZER WITH AUTOMATIC RECORDING OF SIZE-FREQUENCY DISTRIBUTIONS AND TOTAL AND RESPIRABLE SURFACE AREAS. J. Sci. Instr. (London) 43, 744-9, Oct. 1966.

A simple non-rigorous account of the theory of the diffraction size-frequency analyser, an instrument for determining particle

size-frequency distributions, is given. A vacuum metallizing technique is used to obtain an opaque diffraction screen in which each particle is represented by an aperture of the same size and shape as the projection of the particle on to the screen. It is shown that by using illumination coherent in one plane it is possible to obtain an unambiguous length-frequency distribution of aperture chords parallel to the plane of coherence. The size-frequency distribution of the apertures can be obtained from a knowledge of their shape distribution or by assuming a shape distribution which may be regarded as defining the particle size parameter. An instrument, based on this theory, which records the size-frequency distributions or the total and respirable surface areas of dust samples at the rate of 10 samples per min has been developed. The required information is obtained by modulating the far-field diffraction spectrum by means of wave vector filters and integrating the transmitted light with a photomultiplier. The results are recorded either as curves on a recorder chart or printed out in digital form. (Author abstract) ##

C3924

V. A. Tret'yakova

THE DETERMINATION OF 4,4'DIPHENYLMETHANE DUSOCYANATE IN AIR UNDER EXPERIMENTAL CONDITIONS. Hyg. Sanit. 31, (4-6) 73-5, Apr.-June 1966. Rr. (Tr.)
CFSTI, TT 66-51160/4-6

Two methods are suggested for the photometric determination of 4,4-diphenylmethane dusocyanate (DMD). The first method of determination is based on the reaction of DMD with aromatic amines and nitrites for which the sensitivity is 1 microgram in 4.2 ml and the determination error is plus or minus 7%. The second method of determination is based on the reduction of DMD with NO2 ion. In this case the sensitivity is 20 micrograms/5.5 ml for photometric deterination with an FMS-56 instrument, with a mean error of plus or minus 4%; the sensitivity for photometric determinations by the standard series method is 2 microgram/5.5 ml, with an error of plus or minus 10%. DMD vapor is absorbed by acetone when the air is drawn through two absorbing vessels with porous partitions cooled by ice, at a rate of up to 30 1/hr.##

03948

G. Norwitz

A COLORIMETRIC METHOD FOR THE DETERMINATION OF OXIDES OF NITROGEN. Analyst (Cambridge) 91, (1086) 553-8, Sept. 1966.

A method for determining oxides of nitrogen applied to gaseous products derived from initiating compositions is described. The oxides of nitrogen are absorbed from the sample into sulfuric acid, iron (II) sulfate is added and the pink color is measured. The interference effects of a number of gases such as

hydrogen sulfide and sulfur dioxide have been investigated. The range of the method is 0.005 to 5% of oxides of nitrogen, calculated as nitrogen dioxide.##

03965

M. J. Boldue and R. K. Severs

A MODIFIED TOTAL COMBUSTION ANALYZER FOR USE IN SOURCE TESTING AIR POLLUTION. Air Eng. 7, (8) 26-9, Aug. 1965. (Presented before the Division of Water, Air, and Waste Chemistry, 149th National Meeting, American Chemical Society, Detroit, Mich., Apr. 4-9, 1965.)

The development of a Total Combustion Analyzer (TCA) for portable, on-site sampling and analysis of combustion gases for hydrocarbon, carbon monoxide, and carbon dioxide concentrations is described. The TCA was tested in comparison with the Flame Ionization Analyzer and Detector at three industrial sources. The data collected show the TCA unit to be reliable, accurate and capable of on-site use.##

03966

M. J. Boldue, R. K. Severes, and G. L. Brewer

TEST PROCEDURES FOR EVALUATION OF INDUSTRIAL FUME CONVERTERS (SAMPLING AND ANALYTICAL TECHNIQUES REVIEWED FOR). Air Eng. 8, (2) 20-3, Feb. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

The purpose for development of the source testing outline was to permit systematic evaluation of air pollution control equipment on gaseous organic fume streams. Data were obtained to fulfill the following objectives of the source outline: (1) Determination of combustible emission and conversion efficiency. (2) Determination of particulate matter emissions. (3) Identification of specific emissions by laboratory analyses. (4) Determination of the odor concentration of the effluent stream in conjunction with these objectives of source test measurements, the outlined program was to include: (5) A method to check credibility of sampling and analyses. (6) A technique for future monitoring of the control equipment performance. Source tests were conducted on catalytic fume converter units located on a metal-coating oven, a varnish-cooking kettle, a phthalic anhydride plant and a wire-coating oven. Sampling procedures, analytical techniques and developed equipment are discussed. The results of each of the evaluations of the catalytic fume converters are presented.##

03979

F. Schulze

VERSATILE COMBINATION OZONE AND SULFUR DIOXIDE ANALYZER. Anal. Chem. 38, (6) 748-52, May 1966.

A combination analyzer has been devised to overcome mutual interference due to coexistence of ozone and sulfur dioxide in the atmosphere. The measurement principle involves liberation of iodine from an iodide solution by ozone in one channel, and consumption of iodine by sulfur dioxide in a second channel. The iodine concentration is measured amperometrically. The system is standardized by means of coulometrically generated iodine. Sodium iodide reagent is circulated continuously by a two-channel metering pump through a bed of nylon fiber which removes free iodine quantitatively; thus, reagent is regenerated, no replenishment is required, and integrity of the reagent is ensured. Ozone is preferentially removed from air entering the sulfur dioxide channel by filtering through a bed of ferrous sulfate crystals. Sulfur dioxide is removed from the ozone channel by filtering through a bed of quartz chips soaked in a solution of chromium trioxide in aqueous phosphoric acid. The important advantages of the instrument are rapid response, high sensitivity, ease of standardization, and capacity for unattended operation. (Author abstract)##

04018

H. Strathmann and H. Buck

MEASUREMENT OF NITROGEN DIOXIDE IN THE ATMOSPHERE. Messung von stickstoffdioxid in der atmosphare. Intern. J. Air Water Pollution 10, (5) 313-26, May 1966.

Up to the present time there has been no standard process for determining nitrogen dioxide in the atmosphere. Saltzman process is suitable both for discontinuous, continuous and recording measurements, according to international experience to date. The chemical reaction mechanism which forms the basis of this process is, however, still so obscure that different interpretations and calculations of the research findings are made. The behaviour of gaseous nitrogen dioxide towards reaction solution in comparison with the calibration of the process with sodium nitrate was investigated. It was found that, contrary to the classical conceptions, 0.5 M of sodium nitrate are not equivalent to 1 M of NO2, nor, contrary to Saltzman's view, are 0.72 M, but 1 M of NO2 corresponds to 1 M of NO2 ions from sodium nitrite. The calibration factor for a calibration function established with sodium nitrite thus has no value different from 1, contrary to previous conceptions. After calculation of the limit of detection and the reproducibility, the disturbing influences of foreign substances were investigated, with special attention to the behaviour of NO-NO2 mixtures. Discontinuous NO2 emission

measurements can now be carried cut at intervals of 10 min. using a special sampling vessel with an air flow rate of 60 liters/hr. (Author abstract modified)##

04029

E. Sawicki, C. R. Engel, and W. C. Elbert

CHROMATOGRAPHIC LOCATION AND COLORIMETRIC DETERMINATION OF MERCAPTANS, PROLINES AND FREE RADICAL PRECURSORS . Talanta, Vol. 14, p. 1169-1178, 1967. 19 refs.

A new reagent is introduced for the colorimetric determination of free radical precursors, such as cysteine, proline, hydroxyproline, the phenoxazine family, and mercaptans. 7,7,8,8-Tetracyanoquinodimethan (TCNQ) is also useful in the location and characterization on paper or thin-layer chromatograms of proline, hydroxyproline, cysteine, polynuclear compounds, mercaptans, thiocarbonyl amides, and thiosemicarbazones. In addition, amino acid derivatives, such as the N-(phenylthiocarbamyl) amino acids and the 3-phenylthiohydantoins, can be located and characterized on chromatograms. TCNQ has been applied to the location and characterization of atmospheric proline, carbazole, and 11 H-benzo(a)carbazole. For characterization purposes absorption spectra were obtained directly from glass-fiber, paper, or thin-layer chromatograms from about 300 to 900 millimicron. (authors' abstract)##

04040

E. J. Schulz, R. A. Duffee, P. I. Mitchell, and F. W. Ungar

A TRACER TECHNIQUE TO MEASURE DEPOSITION OF STACK EMISSIONS. Am. Ind. Hyg. Assoc. J. 21, (5) 343-9, Oct. 1960.

The uranine tracer technique is a useful tool in the quantitative measurement of the particulate deposition rate of industrial emission. The variable decompositions of uranine solutions exposed to the atmosphere in dust-fall containers prevents the use of dust-fall jars as sampling devices. Based on the laboratory study, uranine can be dispersed as a tracer into stack at stack-gas temperatures up to 600 F without decomposition. With direct stack injection, losses of tracer in the stack must be determined for each application. In using uranine it is mandatory that background fluorescence be determined in the area to be investigated. However, the technique is not limited to uranine. Any soluble material that satisfies the requirements of a tracer can be employed with this method.##

04044

R. V. Doughty and D. O. Erisman

A RELIABLE LOW COST INSTRUMENT FOR DETERMINING ATMOSPHERIC OXIDANT LEVELS. J. Air Pollution Control Assoc., 11(9):428-430, Sept. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The quantitative measurement of atmospheric ozone or oxidants in many communities are carried out by rubber cracking methods. These methods have advantages such as simplicity and low cost. However, the results obtained may vary considerably depending upon the experience and interpretative abilities of the operator. This paper is concerned with the improvement of the rubber cracking method by removal of the element of varying individual judgment, thereby increasing the accuracy and reliability of the method and permitting a more valid comparison of the data produced by different operators. After investigating various techniques, a method similar to that used by the B. F. Goodrich Ozonometer was selected as the basis for this study. This method measures the differential creep in a standard strip of rubber, one half of which is exposed to the atmosphere and the other half of which is protected. Constant stress is maintained in both halves of the rubber strip by a pulley located at the median point of the strip. Oxidant induced creep is measured by the degree of rotation of the pulley. A schematic diagram of the instrument is presented. It is firmly believed that the instrument described in this paper can provide accurate, low-cost measurement of cumulative oxidant levels. The simple, virtually foolproof operation of the instrument eliminates the need for trained personnel and frequent maintenance. The instrument requires no power source and this is readily applied to field sampling at isolated sites.##

04150

V. A. Iozenas and A. P. Kuznetsov

PHOTOELECTRIC SPECTROPHOTOMETER FOR ATMOSPHERIC OZONE OBSERVATIONS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 9-11. 1961. Russ. (Tr.)
CFSTI: TT 66 62191

The design of a spectrophotometer, based on a double quartz monochromator for measuring spectral intensity of zenith scattered solar light, is described. This instrument measures variations in the ratio of spectral intensities of solar light scattered from the zenith in a cloudless sky in daytime, 10 minutes before sunrise and 10 minutes after sunset.##

04151

A. S. Britayev

CHEMICAL OZONE CONTENT DETERMINATION. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 11-21. 1961. Russ. (Tr.)
CFSTI: TT 6662191

Direct chemical ozone measurement in the lower atmospheric layers enabled the exact formulation of boundary conditions for vertical ozone distribution and, in particular, refinement of ozone concentration calculations in the upper atmospheric layers based on ground spectrometric data. Furthermore, it was possible to use tropospheric ozone observations in computing vertical wind motion, turbulence, transfer coefficients, to study relationship between ozone, cloudiness, and precipitation, etc. Development and construction of the electrochemical ozonometer and chemical ozone radiosonde stimulated and advanced the use of chemical and electrochemical methods.##

04153

L. Osherovich and S. F. Radionov

SOME PHOTOELECTRIC OZONOMETER TYPES. U. S. S. R. Literature on Air pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions .) pp. 50-7. 1961. Russ. (Tr.)
CFSTI: TT 66 62191

Result of research in attainment of higher accuracy in ozonometry is presented. Two types of ozonometers, consisting of following three basic units are proposed: (1) A system for discriminating comparatively narrow spectral intervals in the 3100-3300 A and 4000-5000 A regions in some cases; (2) An electrophotometer; and (3) A device for aiming the ozonometers at an extraterrestrial light source.##

04157

G. P. Gushchin

A METHOD FOR COMPUTING TOTAL ATMOSPHERIC OZONE MEASUREMENTS MADE WITH LIGHT FILTER EQUIPPED INSTRUMENTS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases , B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies

Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 101-6. Russ. (Tr.)
CFSTI: TT 6662191

The developed method for computing total atmospheric ozone can be used in association with instruments equipped with glass and other filters. The construction of the ozone nomogram is based on equations and the method eliminates aerosol introduced errors. The proposed ozone nomogram simplifies and facilitates computations.##

04160

G. P. Gushchin

TWO IMPORTANT FEATURES OF OZONOMETRIC INSTRUMENTS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 126-31. 1961. Russ. (Tr.)

Experiments were conducted for the purpose of explaining the effect of the instrument's solid angle on the measured ozone quantity. The first experiment was to determine the functional relation of the ratio between two filter readings to the solid angle of the universal ozonometer at different solar elevations. The second experiment was to determine the functional relationship of reading ratio I1/I2 to altitude above sea level in using instruments having different solid angles at same solar elevation. The solid angle of an optical ozonometric instrument must be small. Its magnitude should be less than 6 degrees at least in two-dimensional coordinates. A solid angle in excess of 10 degrees introduces an additional error in ozone measurements which is associated with atmospheric light scattering. The larger the solid angle and the lower the solar elevation at the time of the measurements, the greater the error. Ozonometric instruments should be provided with means for compensating errors due to temperature. Temperature errors in filter-equipped ozonometers reflected the dependence of filter transmissivity on temperature. (Author conclusions modified)##

04162

A. A. Znamenskii

COMPARISON OF OZONOMETRIC INSTRUMENTS MADE AT THE MAIN A. I. VOEIKOVO GEOPHYSICAL OBSERVATORY. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I - Atmospheric Ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 134-40. 1961. Russ. (Tr.)

A comparative study of ozonometric instruments showed that values obtained in determining total atmospheric ozone simultaneously by different instruments deviated from those recorded by the Dobson spectrophotometer by as much as 23%. Total atmospheric ozone curves plotted from data obtained by different instruments exhibited a general parallelism with an occasional departure. The comparative study established that a universal ozonometer was the most suitable instrument for measuring total atmospheric ozone at all points of a station network. All stations of an ozonometric network should be equipped with identical instruments, preferably of the above described universal type. Parameters of calibrated instruments should be left unchanged, so that the same instruments can be used as the standard in future comparative studies of the instruments' stability with time. It is recommended that nomograms be used by all stations of an ozonometric network for simplification and acceleration of data processing. Standardization of ozonometric instruments should be done in regions where clear air and favorable weather conditions predominate. (Author conclusions modified) ##

04169

P. F. Svistov

CHEMICAL DETERMINATION OF GROUND LAYER OZONE AT VOEIKOVO. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part II - Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 2213-20. 1965. Russ. (Tr.)
CFSTI: TT6662191

Several methods of chemical ozone determination in atmospheric air were tested. In one method the amount of ozone was calculated on the basis of conductometric potassium iodide titration results before and after air aspiration. The second method, which is described in greater detail, was based on ozone density determination by difference between iodine content in the potassium iodide before and after air aspiration. The iodine is extracted with chloroform and its color intensity determined photocolorimetrically. ##

04170

K. I. Romashkina

METHODS FOR THE CALIBRATION OF ZENITHAL AND LUNAR UNIVERSAL OZONOMETER ASSEMBLIES. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part II - Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 220-5. 1965 Russ. (Tr.)
CFSTI: TT 6662191

The proposed method of calibrating zenithal and lunar observations is essentially an empirical one. Some of the

assumptions on which it is based lack verification. Therefore, the accuracy of determining total ozone determination on the basis of zenithal and lunar observations is below the accuracy of solar observations. The use of these data must be approached more cautiously, especially in research studies. Nevertheless, this method can be used advantageously in conducting continuous observations of total atmospheric ozone.##

04223L

A. Belon, N. Brown, G. Cresswell, C. Deehr, G. Romick, and H. Tryon

SPECTROPHOTOMETRY OF ATMOSPHERIC EMISSIONS (TECHNICAL SUMMARY REPT.). Alaska Univ., Geophysical Inst. Mar. 15, 1966. 154 pp.

A scanning spectrophotometer equipped with a S-1 sensitive photomultiplier has been used to obtain auroral spectra in the wavelength region 6400A to 9700A. Emissions of neutral and singly ionized molecular nitrogen, molecular oxygen, hydroxyl, and atomic lines of oxygen and nitrogen were recorded with 10 second scan times and 20A resolution. A comparison of relative intensities of several vibration bands of the N2 1PG system averaged over several scans with theoretical intensities and previously observed intensities reveals no evidence of selective excitation. A similar analysis of the Meinel N2 bands also shows no evidence of selective excitation except possibly for the (C-1) band which seems enhanced on many spectra. Consistent variations in the unresolved rotational profiles of the (1-0) band of N2 1PG and the (1-0) band of N2 Meinel system were compared with synthetic spectra calculated for various assumed temperatures. The comparison shows that the observed variations in the rotational band profile can be interpreted as real temperature variations of the emitting region due in part to auroral heating, and in part to rapid changes in the height of active auroral forms. The observations show that hydroxyl emissions are definitely associated with aurora. The association is not a direct one. There is a time lag of a few seconds between the brightening of the aurora and the enhancement of OH emissions. Similarly the OH emissions decay much more slowly (over a period of minutes) than does the aurora. This suggests that the excitation of the hydroxyl emissions in the aurora is probably due to a chemiluminescent reaction similar to that proposed for the air glow. (Author abstract)##

04241

M. T. Dmitriev and N. A. Kitrosskii

IONIZATION METHODS FOR THE DETERMINATION OF ATMOSPHERIC POLLUTANTS. (K voprosu o primenenii ionizatsionnykh metodov pri opredelenii atmosfernykh zagryaznenii.) Hyg. Sanit. 31, (7) 63-8, July 1966. Russ. (Tr.)
CFSTI: TT 66-51160/7-9

By utilizing radioelectronic means, ionization methods of determining atmospheric pollutants ensure reliability, high precision and rapid automatic recording of results. The prospects for using these methods are assessed and their theoretical principles are examined. The methods included are: thermoionization, photoionization, electric discharge, radioactivity ionization, argon ionization, electron capture, and mass spectrometry.##

04281

J. F. Griffiths and M. J. Griffiths

A BIBLIOGRAPHY OF MESO- AND MICRO-ENVIRONMENTAL INSTRUMENTATION. Texas Agricultural and Mechanical Univ., College Station Dept. of Meteorology. (Technical Note 43-EDS 2.) July 1966.
CFSTI: PB 173 088

In the past, the meteorologist has been generally concerned with the gross features of the atmosphere, measured with instruments of relatively coarse sensitivity. Today, and in the future, the environmental scientist is and will be concerned with measurements of the meso- and micro-environment. Since it will often be impossible to use standard meteorological instruments, he will either have to turn to specialized equipment and personally constructed instruments, or will have to modify commercially available apparatus. This bibliography was prepared in anticipation of these needs and is intended to guide the researcher to pertinent subject references. The bibliography is not completely comprehensive, but concentrates on the lower atmosphere and the upper layers of the soil.##

04328

E. Sawicki, M. Guyer, and C. R. Engel

PAPER AND THIN-LAYER ELECTROPHORETIC SEPARATIONS OF POLYNUCLEAR AZA HETEROCYCLIC COMPOUNDS. Preprint. 1967.

A large number of polynuclear aza heterocyclic compounds have been separated by paper and thin-layer electrophoresis. The pherograms were scanned fluorimetrically. Many of the separated compounds were capable of being characterized and assayed by the scanning procedure. Analysis by fluorimetric scanning of the pherograms was much more selective when the appropriate excitation and emission wavelengths were used. Samples of urban airborne particulate can be separated and analyzed with the help of paper or thin-layer electrophoresis. (Author abstract)##

04405

O. Cucchiara, B. Bex, T. Donaghue

THE DEVELOPMENT OF AN INSTRUMENT FOR THE DETECTION OF HAZARDOUS VAPORS. Parametrics, Inc., Waltham, Mass. (Technical Rept. No. AFAPL-TR-65-50.) June 1965. 54 pp.
DDC, AD 465094

A prototype model of an instrument which is capable of detecting low concentrations of hydrogen, fluorine and fluorine-containing oxidizers was developed. The instrument provides an audible alarm within three to five seconds after exposure to near hazardous concentrations of these gases. The alarm concentrations are either 0.5% or 1.0% hydrogen, and .025 ppm of fluorine, chlorine trifluoride or oxygen difluoride. Other detection levels (both higher and lower) could be set if required. The basis of this technique is that the loss of radioactivity of a kryptonated homolog upon reaction with a gas is proportional to the concentration of the reacting gas. The instrument is portable, simple to operate, and reiable. The instrument incorporates the technique of radiochemical exchange using kryptonates. Selectivity is achieved by the utilization of different kryptonated sources for the various gases. Other gases can be detected with this instrument by using appropriate kryptonate homologs. (Author abstract) ##

04458

J. L. Fergason, N. N. Goldberg, C. H. Jones, R. S. Rush, L. C. Scala, and P. Davis

DETECTION OF LIQUID CRYSTAL GASES (REACTIVE MATERIALS). Westinghouse Electric Corp., Pittsburgh, Pa., Research Labs. (Technical Rept. No. RADC-TR-64-569.) Aug. 1965. 127 pp.
DDC, AD 620 940

The purpose was to determine whether reactive liquid crystals could be developed that would detect 1 to 10 ppm of certain gases. Satisfactory materials were produced to detect hydrazine hydrate (HH), unsymmetrical dimethylhydrazine (UDMH), NO_2, HNO_3, HF, and HCl. With the exception of HCl and HF, all of the gases could be readily distinguished from one another. Temperature-sensitive detectors were developed which are capable of distinguishing between HH and UDMH at concentrations of 8 ppm. A number of detectors were developed that respond to the oxides of nitrogen, and detection of 6 ppm of NO_2 was satisfactorily achieved. N_2O, which is relatively inert, was found not to react with any of the systems studied. When oxides of nitrogen are present in an atmosphere that contains any water vapor, HNO_3 will be formed. Materials that detected 1 ppm of HNO_3 were prepared and tested. Two detectors were developed that will detect HCl and HF at concentrations below 1 ppm. However, no simple method for distinguishing between the two was found. The set of reactive cholesteric liquid crystals exhibit a change in color transition temperature upon exposure to the contaminants.##

04467

M. W. Hodge and K. D. Bell

AN OZONE CALIBRATOR. Environmental Science Service Administration, Washington, D.C., Weather Bureau. Aug. 1965. 24 pp.
CFSTI, PE 168 476

The design and operation of a simple ozone calibrator has been presented. The calibrator is designed to operate over a range of ozone densities from 60 to 250 micrograms per cubic meter. The method is based on Faraday's law of electrolysis and is absolute in its calibration. It consists essentially of an ozone titration of a neutrally buffered potassium iodide solution containing a calibrated quantity of sodium thiosulfate. The calibration of the solution is performed electrochemically with an iodine meter. The equipment was designed specifically to monitor an ozone source which gives a reasonably constant ozone density air stream over a period of several days or weeks of use. However, the source may vary due to aging and other unpredictable changes in various control components of the ozone source. The calibrator gives a repeatability of + or - 10 percent. (Author abstract)**

04499

F. P. Terraglio R. M. Manganelli

LABORATORY EVALUATION OF SULFUR DIOXIDE METHODS AND THE INFLUENCE OF OZONE-OXIDES OF NITROGEN MIXTURES. Anal. Chem. 34, (6) 675-7, May 1962. (Presented before the Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

The laboratory evaluation of three wet chemical methods used to measure atmospheric SO2 concentrations is reported. Of the three methods (acidimetric, West and Gaeke spectrophotometric, and iodimetric), the first two gave comparable average recoveries over the concentration range of 0.3 to 3.78 mg of SO2 per cubic meter. Recoveries by the iodimetric method over the same concentration range were lower than the spectrophotometric method. The presence of ozone-oxides of nitrogen mixtures interfered with all three methods. The West and Gaeke spectrophotometric method gave the most precise result when the absolute amount of sulfite trapped was in excess of 0.1 mg.**

04555

O. Tada

DETERMINATION OF NITROGEN OXIDES IN THE AIR. Rept. Inst. Sci. Labour, 60 pp. 7-26. July 26, 1962.

Procedures for the discriminative analysis of nitrogen oxides (NO, NO2, N2O4, HNO3 or N2O5) were examined along with determinations of nitrite and nitrate and oxidation conditions whereby NO forms nitrite or nitrate entities. Analyses of nitrogen oxides in air samples of engine exhaust gas, combustion effluents (coal, coal gas and kerosene) and cigarette smoke were also made. NO was found together with NO2 in varying proportions depending on the source and other factors; also NO accounted for the major part of nitrogen oxide in each sample. HNO3 was rarely detected as far as the samples investigated were concerned.##

04579

A. J. Haagen-Smit M. F. Brunelle

THE APPLICATION OF PHENOLPHTHALIN REAGENT TO ATMOSPHERIC OXIDANT ANALYSIS. Intern. J. Air Water Pollution 1, 51-9, 1958.

In recent years, a form of air pollution has developed which is characterized by a strong oxidizing effect. For the measurement of this effect of colorimeteric method has been developed, based on the oxidation of phenolphthalin to phenolphthalein. Good correlation has been reported between oxidant determined by this method and subjective observation, and a comparison is made of data obtained by different methods. A simple, semi-automatic sampler is described, and the results of 5 years of continuous sampling are presented. (Author abstract)##

04596

R. Smith

PROGRAM DEVELOPMENT THROUGH APPLYING MEASUREMENTS AND MONITORING KNOW-HOW. Proc. Natl. Conf. Air Pollution, Washington, D.C., 1962. pp. 233-45. 1963.

Author directs our attention to the problem of appropriate air quality. Many large communities are able to deal with the direct nuisance problem in which there is a specific individual source of pollution and some rather direct social or economic effects on adjacent inhabited areas. While such programs eliminate many source of complaint, they seldom provide a community with an overall air quality of a desirable nature. Although this problem is complex and knowledge is imperfect, author discusses simple guidelines through which reasonable long-range objectives can be delineated. Such objectives are capable of periodic evaluation as knowledge and techniques improve.##

04623

E. Matijevic, M. Kerker, and K. F. Schulz

LIGHT SCATTERING OF COATED AEROSOLS. PART I. SCATTERING BY THE AGCI CORES. Discussions Faraday Soc. (Aberdeen) (Scotland) (30) 178-84, 1960.

The preparation of silver chloride aerosols consisting of spherical particles of narrow size distribution by a condensation technique is described. The particle size distribution was determined by electron microscopy. Excellent agreement was obtained between the polarization ratio from light-scattering measurements and that calculated from the particle size distribution and theoretical scattering functions. Since the light scattering itself was insensitive to particle size distribution over a wide range of sizes studied (radius, 200-800 millimicrons), the determination of particle size distribution from light scattering is not feasible for this range. However, there is an optimum range of size (rav equivalent ot 55.0 millimicrons) where particle size distribution can be obtained from light scattering. (Author abstract)##

04635

W. P. Serat, P. E. Budinger, and P. K. Mueller

TOXICITY EVALUATION OF AIR POLLUTANTS BY USE OF LUMINESCENT BACTERIA. Atmos. Environ. (London) 1, (1) 21-32, Jan. 1967. (Presented at the Seventh Confreence of Methods in Air Pollution Studies, Los Angeles, Calif., Jan. 25-26, 1965.)

Cells of a species of luminescent bacteria were treated with a gas stream containing products formed by the photochemical oxidation of cis-2-butene and NO. Luminescence and viability decreased with the time of irradiation of reactants. The rate of luminescence decrease was dependent on the ratio of the initial concentrations of cis-2-butene and NO with a ratio of giving the most rapid loss. Known photochemical oxidation products, ozone, NO2, formaldehyde, acetaldehyde, and PAN were examined individually. Aldehydes did not appear to contribute to the decrease in luminescence but ozone and PAN did. Although NO2 alone up to 0.5 ppm produced no decrease, it may contribute to the luminescence loss in the total irradiation mixture. The total oxidant concentration produced upon irradiation gave luminescence decreases which were matched by comparable concentrations of pure ozone. However, this does not imply that luminescence losses caused by photochemical oxidants are due only to ozone. A possible mechanism of the toxic effect and the interpretation of this bioassay in relation to other organisms are briefly discussed. (Author abstract)##

04643

J. T. Shaw

THE MEASUREMENT OF NITROGEN DIOXIDE IN THE AIR. Atmos. Environ. 1, (2) 81-5, Mar. 1967.

A method for determining whether an electrolytic generator gives a quantitative output of NO2 is described. The Hersch electrolytic NO2 generator was used to provide accurately known weights of NO2 and thus to evaluate a calibration factor for Saltzman's colorimetric reagent used for the determination of the

gas. The test confirms the value of 0.72 for the calibration factor. An assertion that the calibration factor is dependent on the concentration of nitrogen dioxide sampled, is reexamined and dismissed, the observations being re-interpreted on a simple basis. (Author abstract modified)##

04667

R. K. Sharma, D. F. McLean, J. Bardwell

AN APPARATUS FOR THE ANALYSIS OF COMBUSTION PRODUCTS OBTAINED DURING THE OXIDATION OF HYDROCARBONS. Indian J. Technol. (India) 3, (7) 206-8, July 1965.

A gas chromatographic apparatus with several improved features, permitting the analysis of complex mixtures of combustion products obtained during the oxidation of hydrocarbons is described. The improved features are (1) a sampling device that avoids the use of stopcock grease and permits operation at elevated temperatures and pressures; (2) six-way valves that facilitate sample injection; and (3) a dual-column gas chromatograph permitting separation of compounds with widely varying boiling points. The products obtained by the low temperature (284 C.) oxidation of propane and butane have been analysed using this apparatus. Although the gas chromatographic method is particularly appropriate for most types of combustion products, it is less satisfactory for certain highly reactive products, namely hydrogen peroxide, formaldehyde and organic acids. The presence of formaldehyde in the combustion gases has a detrimental effect on the gas chromatographic analysis for certain other compounds, notably methanol. (Author abstract modified)##

04696

M. E. Morrison and W. H. Corcoran

OPTIMUM CONDITIONS AND VARIABILITY IN USE OF PULSED VOLTAGE IN GAS-CHROMATOGRAPHIC DETERMINATION OF PARTS-PER-MILLION QUANTITIES OF NITROGEN DIOXIDE. Anal. Chem. 39, 255-8, Feb. 1967.

The electron-capture detector has been shown to be very sensitive to compounds with high affinities for free electrons. Because of the relatively high electronegativity of the nitrogen oxides, an electron-capture detector was studied for its applicability in the detection of parts-per-million quantities of nitrogen dioxide. With the objective of analyzing NO2 at concentrations below 1 ppm a plane-parallel electron-capture detector was designed and built. The effects of temperature, flow rate, size of tritium source, voltage, and the means of applying voltage to the plane-parallel detector were studied. In the study of the methods for applying voltage, direct current and pulse modes were used. A Loenco 15A gas chromatograph with a Loenco 15E electrometer was used in the study. The plane-parallel detector

which was built was similar to one described by Lovelock. A source of approximately 180 mc of tritium was used. A conditioned Fluoropak 80 column was operated at 22 C. Argon was used as both a scavenger and carrier gas. In the study of the optimum conditions of operation, 0.5-cc samples of nitrogen containing 88.3 ppm of NO2 were used. For the d.c. method of operation with the plane-parallel detector, the most sensitive response was with a carrier flow of 10 cc per min of argon, a scavenger flow of 10 cc per min, and a detector potential of 4.5 v. The plane-parallel design required a lower potential and scavenger flow for optimum response in comparison to the opposed-flow Barber-Colman detector i.e. 4.5 vs. 33 v and 10 vs. 85 cc per min., respectively. With the pulse mode of operation, the response of the plane-parallel detector was relatively independent of voltage between 10 and 50 v. The sensitivity of the electron-capture detector operated in the pulse mode was increased approximately fourfold in the concentration region from 1 to 10 ppm NO2 when the temperature was decreased from 200 to 25 C, but the effect was not linear with temperature. In fact, nearly all of the increase in sensitivity was obtained in the range from 90 to 25 C. An increase in the strength of the tritium source did increase the response for a given quantity of NO2, but the noise level was increased in the same proportion. Thus, the absolute sensitivity was not a function of source strength as long as a reasonable background current could be obtained. The chromatographic determinations compared very favorably with chemical techniques for the analysis of NO2.##

04767

G. M. Mast, and H. E. Saunders

RESEARCH AND DEVELOPMENT OF THE INSTRUMENTATION OF OZONE SENSING. ISA (Instr. Soc. Am.) Trans. 1, (4) 325-8, Oct. 1962. (Presented at the Summer Instrument-Automation Conference and Exhibit, Instrument Society of America, San Francisco, Calif., May 9-12, 1960.)

The current status of the Microcoulomb Ozone Sensor including operating parameters is summarized. Its use in a continuous sensing and recording ozone meter is described, as well as its application in a balloon sounding instrument. Essentially a high-sensitivity device of limited scale, it is able to distinguish ozone in air in the range of one part per billion. (Author abstract modified) ##

04769

G. N. Plass

THE ABSORPTION OF LASER RADIATION ALONG ATMOSPHERIC SLANT PATHS. Appl. Opt. 5, (1) 149-54, Jan. 1966.

The absorption of laser radiation along atmospheric slant paths is calculated when Lambert's law is valid. Illustrative results are

given for absorbing gases which are distributed uniformly throughout the atmosphere and when the temperature variation of the line intensities and half-width can be neglected. These results are then generalized to include cases of nonuniformly distributed gases with a temperature variation along the path. The effect of the overlapping of spectral lines is studied through the use the Elsasser model. Finally, it is shown that large differences in the absorptance may occur between corresponding frequencies in the red and violet wings when there is a shift in the position of the line center with pressure. This line shift could ideally be studied with laser sources. (Author abstract)##

04796

J. E. Sigsby, Jr., L. J. Lage, T. Bellar, and M. L. Eisele

CHEMICAL METHODOLOGY IN AUTO EXHAUST STUDIES. Preprint. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

A major auto exhaust research project requires extensive chemical analytical support. Such compounds as NO, NO2, acrolein, and the individual hydrocarbons and such classes of compounds as olefins and oxidants are determined routinely. Sampling schedules and conditions are important in the over-all program. This paper describes the specific analyses and the general laboratory program that provide the greatest amount of significant chemical information. The procedures discussed include IR spectroscopy, wet chemical analysis and gas chromatography. Wet chemical analyses are made for NO2, NO, four-carbon and higher olefins, acrolein, and formaldehyde. All samples for wet chemical analysis are taken with bubblers. A Beckman Spectrophotometer, Model DU, is used to determine absorbance. For hydrocarbon analysis the gas chromatograph used is a modified three-stage instrument. The first and second stages are operated in series, using thermal conductivity detectors and helium carrier gas. The third stage operates separately with a flame ionization detector and a silica gel column to determine the higher hydrocarbons. The first two stages are used in conjunction with a double trapping system to determine four-carbon and higher materials. The utilization of this array of testing methods and equipment requires careful planning, if each experiment is to yield maximum information. On one occasion 50 samples were analyzed in a 4-hour period; this is more than one sample every five minutes, and is typical of the quantity of data that may be obtained if necessary. Normally, the reproducibility of the chemical results is better than 10%.##

04839

R. K. Stevens and R. E. Painton

APPLICATION OF A HOT WIRE IONIZATION DETECTOR TO AUTOMOTIVE EXHAUST GAS ANALYSIS. Micro Tek Instruments Corp., Baton Rouge, La. Mar 17, 1967. 26 pp.

The objective was to investigate the application of a catalytic combustion ionization detector to the determination of hydrocarbons in automotive exhaust. The catalytic element is a coiled platinum hot wire of the general type used in conventional catalytic combustion detector cells in which thermal effects are measured. In the present device the effect measured is the ion current resulting from charged radicals formed during the process of catalytic combustion. A major feature of this technique for auto exhaust gas analysis is its complete selectivity to C2+ hydrocarbons in the presence of CO, H2, CH4, CO2, air and H2O. The effect of operating parameters on selectivity to different types of hydrocarbons was examined, results are compared to those obtained with the Flame Ionization Detector, and typical results on actual auto exhaust samples are reported. The CCID (Catalytic Combustion Ionization Detector) can be a critical component in a composite "black box" analyzer to be used for field surveillance of automobile exhaust with regard to emission of hydrocarbons and carbon monoxide. (Author summary modified)##

04857

G. Dimitriades

DETERMINATION OF NITROGEN OXIDES IN AUTO EXHAUST. J. Air Pollution Control Assoc. 17, (4) 238-43, Apr. 1967.

A new procedure for determining nitrogen oxides in automobile exhaust has been developed. The new procedure was included in a Bureau of Mines comparative study that aimed at evaluating various widely used methods for determing NOx in auto exhaust. The methods included in the evaluation study follow: (1) Static oxidation in tank (ST method). The method involves oxidation of NO in residence with O2 in a stainless steel tank. (2) Bureau of Mines method (BM method). The method involves application of the ST procedure in exhaust samples from which the gydrocarbons have been revoced by combustion over catalyst. (3) Chevron Research method (CR method), as described in the literature. (4) Phenoldisulfonic acid method (PDS method), as described in the literature. The principal objective of this study was to generate experiemental evidence which would lead to defining an optimum procedure for converting NO, present in exhaust gas, into NO2; this conversion is desired so that the total of NO + NO2 can be determined quantitatively in the form of NO2. In pursuing this objective, the procedures prescribed by the foregoing methods were comparatively tested. The results indicated that all four methods are subject to error, the extent of which depends on the conditions employed. The BM method was superior from the standpoint of accuracy because it was less affected by interferences due to hydrocarbon-NO2 reactions. (Author abstract)##

C4880

B. C. Newbury

THE USE OF THE CORRELATION SPECTROMETER IN THE STUDY AND CONTROL OF AIR POLLUTION. Preprint. (Presented at the Air and Water Pollution Conference, Sacramento, Calif., Feb. 2-3, 1967.)

The Barringer Correlation Spectrometer is a highly specific instrument offering great advantages in pollutant monitoring: (1) It is a physical measurement and does not require frequent renewal of reagent solutions; (2) It can operate through a wide range of temperature: it does not require constant temperature enclosures, or even protection from freezing; (3) It requires no pumps or valves. The passive model requires power only for the electronics and remote operation using solar cells if possible; and (4) The basic instrument is suitable for a large number of compounds, reducing drastically, the spare parts and expertise required, in comparison with the usual range of unrelated instruments. The Barringer Tape Sampler is a modular sampler of improved design and with a very flexible timing control unit. The sequential sampler module will be additive for extended sampling schedules.##

04881

A. R. Barringer

NEW INSTRUMENTATION AND TECHNIQUES FOR POLLUTION MONITORING. Preprint. (Presented at the Air and Water Pollution Conference, Sacramento, Calif., Feb. 2-3, 1967.)

Correlation spectrometers utilize an internal memory of the spectrum which it is desired to detect. Real time correlation is carried out against the spectrum of the incoming radiation. The first of these devices uses a conventional grating spectrometer. A photographic replica of the spectrum of the gas being detected is installed in the position normally occupied by the slit of a dispersive spectrometer. A spectrometer is used to make the replica mask, by exposure through a cell of the gas, matching exactly the dispersion and aberration characteristics of the spectrometer. The unknown spectra of the incident light is caused to vibrate across the correlation mask, by using a refractor plate oscillating in a rotary fashion to displace the entrance slit image from side to side. Phase locked detection of the output of the photo-multiplier is carried out in synchronism with the oscillations of the refractor plate. Integration of the synchronous detection can be made over a period varying from a fraction of a second to several seconds. A telescope may be incorporated in the instrument. Alternative means may be employed for oscillating the slit image such as a high stability tuning fork and dual refractor plate assembly. An instrument of this type has been programed for sulfur dioxide detection. It is capable of detecting concentrations as low as ten parts per billion over a one hundred meter pathlength. It is highly specific for sulfur dioxide having an excellent immunity ot interferences. Operation is in the ultraviolet region between 2,900 and 3,150 Angstroms where there is sufficient solar spectral radiant flux penetrating the atmosphere to enable the equipment to function passively using natural daylight. An automatic gain control system operates on the average DC value of the photomultiplier output. The AC signal under these conditions is directly proportional to the percentage modulation caused by sulfur dioxide.##

04882L

National Council for Stream Improvement, Inc., New York, N. Y.

STATUS OF PRESENT INVESTIGATIONS AND FUTURE RESEARCH NEEDS IN ATMOSPHERIC POLLUTION CONTROL AT-TBull-29, 13p., June 1966.

The current status of research and technical programs concerning the kraft mill industry is reviewed. The following topics are included: (1) Analytical methods for source-gas sampling and gas-flow measurement, (2) Black liquor oxidation, (3) Absorption and oxidation of sulfur compounds, (4) Particulate emission control, (5) Meteorology and ambient-air-sampling techniques, (6) Cooperative mill service activities, and (7) Staff technical activities.##

C4900

M. Frossard, R. G. Rinker, and W. H. Corcoran

DETERMINATION OF SMALL QUANTITIES OF NITRIC OXIDE AND NITROGEN DIOXIDE IN NITROGEN BY GAS CHROMATOGRAPHY. Am. Soc. Testing Mater. Spec. Tech. Publ. 352, 56-9, 1964. (Presented at the Symposium on Air Pollution Measurement Methods.)

Studies were made on the determination of nitric oxide (NO) and nitrogen dioxide (NO2) present at less than 5000 ppm by volume in nitrogen. The work was a continuation of previous studies on the quantitative analysis of small amounts of nitric oxide in nitrogen by gas chromatography using a silica gel column. The nature of the results suggests that NO and NO2 are irreversibly adsorbed in small quantities of silica gel. This strong adsorption, separate from a physical or van der Waals adsorption, forms a basis for separation of small amounts of NO and NO2 subsequent to an initial conditioning of the silica gel with these oxides of nitrogen (N 2). (Authors' abstract)##

04915

F. P. Sakaida, R. G. Rinker, R. F. Cuffel, and W. H. Corcoran

DETERMINATION OF NITRIC OXIDE IN A NITRIC OXIDE - NITROGEN SYSTEM BY GAS CHROMATOGRAPHY. Anal. Chem. 33, (1) 32-4, Jan. 1961.

Data are presented to show the precision in the determination by gas chromatography of nitric oxide present to the extent of 0.404% by volume in a nitric oxide-nitrogen mixture. Silica gel was used as a packing in an 8-foot column, and a dual-thermistor thermal conductivity cell was used as a sensing element. The 3-sigma limit of standard deviation for a set of data containing

effectively 90 individual measurements was about + or - 4%. The separation of the nitric oxide was affected by the conditioning of the column with NO2 which was strongly adsorbed on the silica gel. The adsorbed NO2 probably formed a weak bond with the NO in the gas sample to give adsorbed N2O3 which readily decomposed to give up NO, but with fractionation from the N2. The techniques permit the determination of NO at concentrations from at least 1000 to 10,000 p.p.m. in N2 for an expenditure of time of less than 20 minutes per determination. It is believed that the procedure could readily be extended to as low as 50 p.p.m. of NO in N2.##

04968

F. T. Gucker, Jr.

DETERMINATION OF CONCENTRATION AND SIZE OF PARTICULATE MATTER BY LIGHT SCATTERING AND SONIC TECHNIQUES. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949. pp. 14-25.

In the study of aerial disperse systems, a knowledge of the concentration and size of the individual particles frequently is necessary. Until recent years the methods available were tedious, time-consuming, and frequently unsatisfactory. Recently, new instrumental methods have been applied to the solution of these problems. Their development, applicability, and limitations are the subject of this paper. The theory of many of the optical properties of aerosols are utilized to determine the mass concentration, particulate concentration, and size of aerosol particles rapidly and conveniently.##

04973

P. L. Magill

TECHNIQUES EMPLOYED IN THE ANALYSIS OF LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949. pp. 61-8.

An analysis of smog was undertaken with the major objectives being the determination of the materials responsible for the reduction of visibility and those responsible for eye irritation. The instruments and methods used for collecting particulate and gaseous matter from the atmosphere are described. A new method for semi-quantitative analysis of samples by proton bombardment is explained. A tabular summary of the components of Los Angeles smog is provided. The effects of particulate matter on visibility are described and a simulation experiment is mentioned which shows eye irritation to be the result of the synergistic effect of several substances.##

04979

C. Steffens S. Rubin

VISIBILITY AND AIR POLLUTION. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949. pp. 103-8.

When polluting substances are present in the air, the size and size distribution of the suspended particles, and their optical constants, will usually differ from those of particles that are present naturally. That is, there is a qualitative change in the aerosol, rather than a mere increase in concentration of particles that are otherwise identical with those present naturally. The optical constants of the particles are related to the optical properties of the haze. Consequently, measuring these optical properties is one way of getting information about the physical characteristics of the suspended particles. The first part of this paper is concerned with the method of measuring the attenuation coefficient, which is directly related to the visibility, and with some conclusions that can be drawn from the results of such measurements. The latter part is concerned with the results of measuring the attenuation coefficient at different wave lengths, since such measurements yield an estimate of the size distribution of the aerosol.##

05070

R. P. Lewis

MODIFICATION OF GAS SAMPLING APPARATUS FOR USE IN SHORT-TERM AIR POLLUTION STUDIES . J. Air Pollution Control Assoc. 14, (9) 370-1, Sept. 1964.

Details describing modifications to the gas sampling apparatus developed and used by the U. S. P. H. S., Division of Air Pollution, are given. These modifications have resulted in the following improvements: lighter weight, reduced breakage, reduced expense, and increased ease of operation. The unit is self-contained, can be shipped and handled easily, and can be operated by one man. (Author summary)##

05078

E. P. Kuczynski

EFFECTS OF GASEOUS AIR POLLUTANTS ON THE RESPONSE OF THE THOMAS SC 2 AUTOMETER. Environ. Sci. Technol. 1, (1) 68-73, Jan. 1967.

A study was made of the quantitative response of the Thomas SO2 autometer to gases that might coexist with SO2 as air pollutants. These gases included NO2, NO, HCl, CL2, NH3 , and HF. The gas mixtures were prepared dynamically at the

ppm level by a flow mexing methcd to a high degree of accuracy. Syringe pumps were used to add small quantities of pure gases to a large vol. air stream. The effects of NO2, NO, and HF on the SO2 reading were small, but HC1, NH3, and CL2 gave significant response. (Author abstract)##

05081

G. Norwitz

SPECTROPHOTCMETRIC DETERMINATION OF TOTAL OXIDES OF NITROGEN BY FERROUS SULFATE REACTION . Army Frankford Arsenal, Philadelphia, Pa. (Test Rept. No. T66-2-1.) Nov. 1965. 33 pp.

An accurate and rapid method is proposed for the determination of total oxides of nitrogen in gases from initiators and other explosive devices. Total oxides of nitrogen include nitric oxide, nitrogen dioxide, nitrogen trioxide, nitrogen tetroxide and nitrogen pentcxide. It is frequently customary to determine the total of these oxides because of the similarity in their tcxicity, mode of formation, and the ease with which they are converted to each other in equilibrium reactions. In the proposed method the oxides are treated with air and are absorbed into sulfuric acid (10 to 3). Ferrous sulfate reagent is then added and the pink color is measured. It is not necessary that the air oxidize nitric oxide completely. It is shown that nitrate and nitrite give the same color with the ferrous sulfate reagent. The method was checked by a technique using a modified Hamilton syringe, together with a special gas bulb and laboratory cylinders of nitric oxide and nitrogen dioxide. (Author abstract)##

05121

L. R. Zwang and L. M. Gutman

MEASUREMENT OF LIGHT ATMOSPHERIC ICN SPECTRA. Acad. Sci., USSR, Bull. Geophys. Ser. (Izv. Geophys. Ser. 1958, pp. 891-902.) (7), 507-12, 1958. Russ. (Ir.)

A method of solving the integral equations which are characteristic of transient processes in ion chambers is presented. Geophysical results, obtain frcm measurements of light atmospheric spectra in the El'brus expedition of the Academy of Sciences, USSR, are discussed. The essence of this method is presented. A sample of the air under investigation is admitted into a cylindrical ion chamber which is then closed and a constant voltage is applied to its outer electrode. An ionic current begins to flow inside the chamber; it is caused by the motion of ions contained in the air sample. This current decreases with time, because at first the more mobile, and afterwards the less mobile ions reach the electrodes of the chamber. By measuring the magnitude of the current at various instances of time, one can determine ionic spectrum. The magnitude of the current flowing through the central electrode of the chamber is related to the mobility-distribution density of the ions n (w) through an integral equation.##

05136

Sawicki, E. and R. A. Carnes

FLUORIMETRIC ASSAY FOR ALPHA-GLYCOLIC COMPOUNDS AND OTHER ALDEHYDE PRECURSORS . Microchim. Acta, No. 3:602-607, 1968. 2 refs.

Three reagents and a variety of fluorimetric methods are introduced for the assay of alpha-glycolic compounds, polar olefinic compounds, and olefins. The procedures are based on the controlled oxidation of these compounds to aldehydes and analysis of the aldehydes with J-acid, 2,4-pentanedione, or dimedon. Most of the methods show reasonable sensitivity and accuracy and should be capable of use in air pollution studies. Recommendations are made for their use. Results confirm the presence of large amounts of alpha-glycolic compounds in aqueous extracts of urban airborne particulates. (Authors' abstract)##

05158

R. D. MacPhee, M. G. Eye, and E. E. Parkinson

A METHOD FOR MONITORING ORGANIC LEAD IN THE ATMOSPHERE. Los Angeles County Air Pollution Control District, Calif. and Cincinnati Univ., Ohio, Kettering Lab. Sept. 1962. 14 pp.

High concentrations of lead in the atmosphere can be measured by a number of chemical and physical methods. For low concentrations, however, the most sensitive method is based on a color change in dithizone. With a suitable modification to the crystalline iodine collection procedure of Snyder and Henderson, the dithizone test was adopted in the District laboratory for hourly monitoring of the organic lead vapor content of the atmosphere. Following the collection of the sample in iodine, a double extraction with dithizone is employed to eliminate interfering ions. The color of the final extract is measured spectrophotometrically.##

05190

R. M. Schotland

THE DETERMINATION OF THE VERTICAL PROFILE OF ATMOSPHERIC GASES BY MEANS OF A GROUND BASED OPTICAL RADAR. Proc Symp. Remote Sensing Environ., 3rd, Ann Arbor, Mich., 1964. pp. 215-24. Feb. 1965.
CFSTI, DDC: AD 614032

An analysis is presented on a remote sounding method in which the vertical distribution of absorbing gases such as water vapor and ozone may be determined. This is done by a study of the spectral distribution of the backscatter from a pulse of light generated by a vertically pointing optical radar. An experiment is described in which the measurement of the vertical distribution

of atmospheric ozone was attempted using a pulsed krypton flash lamp as an energy source. A discussion is given of an optical radar system under development using a thermally tuned ruby laser source which is designed to determine the vertical profile of water vapor. (Author abstract)##

05191

A. R. Barringer

DEVELOPMENTS TOWARDS THE REMOTE SENSING OF VAPOURS AS AN AIRBORNE AND SPACE EXPLORATION TOOL . Proc. Symp. Remote Sensing Environ., 3rd, Ann Arbor, Mich., 1964. pp. 279-92. Feb. 1965

The remote sensing of geochemical parameters is investigated. The techniques under study and development are concerned with sensing the dispersion of volatile components of orebodies or their oxidation products in the surface soils and in the air above. The elements and compounds of interest include mercury, iodine and sulphur dioxide in connection with metal bearing deposits, and hydrocarbon gases and iodine in association with oil fields. (Author abstract)##

05257

F. E. Saalfeld

MASS SPECTROMETRIC DETERMINATION OF THE ALIPHATIC AND AROMATIC CONTENT OF A HYDROCARBON MIXTURE . Naval Research Lab., Washington, D.C., Chemistry Division. (NRL Rept. No. 6178.) Nov. 12, 1964. 8 pp.

A simplified mass spectrometric technique has been devised for determining the aromatic content in hydrocarbon mixtures of the type that have been recovered from adsorptive carbon samplers exposed in the atmospheres of nuclear submarines. The method is based on the summation of ion currents at mass-to-charge ratios (m/e) of 27, 28, 29, 41, 43, and 57 for aliphatic hydrocarbons and aromatic hydrocarbons. The mass spectrometric results agree reasonably well with Fluorescence Indiator Adsorption analyses of the same samples. While, due primarily to cost and operational complexity, no available mass spectrometers are suitable for shipboard operation, future developments in the field of mass spectrometry should be carefully observed for advances that make such use possible. (Author abstract)

05299

M. Katz

STANDARDIZATION OF METHODS OF MEASUREMENT OF AIR QUALITY IN MEMBER COUNTRIES . Preprint. (1963)

Measurement methods for dust fall, suspended particulates, sulfur dioxide, sulfur trioxide, sulfuric acid, nitrogen oxides, ozone or oxidants, and hydrocarbons are reviewed. Standardization of techniques and methods of reporting data is a prerequisite for international exchange of information and for further co-operative research in order to establish a sound basis for the control of air pollution.

05314

Crider, Walter L. and Arthur A. Strong

FLAME IONIZATION-PULSE AEROSOL PARTICLE ANALYZER (FIPAPA). Rev. Sci, Instr., 38(12):1772-1775, Dec. 1967. 8 refs.

An instrument is described that counts automatically according to size aerosol particles of certain specific chemical compositions. The technique employed depends on converting to current pulses the ions produced from airborne particles passing through the combustion zone of a flame. By use of electronic pulse-height circuits, these current pulses are subsequently counted in six ranges of magnitude. Individual particles of KOH as small as 0.15-micron diameter can be detected by this instrument. (Authors' abstract)

05319

Engel, C. R., and E. Sawicki

A SUPERIOR THIN-LAYER CHROMATOGRAPHIC PROCEDURE FOR THE SEPARATION OF AZA ARENES AND ITS APPLICATION TO AIR POLLUTION. J. Chromatog., Vol. 31, p. 109-119, 1967. 8 refs.

A thin-layer-chromatographic method for separation of polynuclear aza heterocyclic compounds with silica gel is presented which is superior to previously reported paper and thin-layer chromatographic methods. Many of the groups of compounds had run together in previous separation methods. This procedure has been applied to the separation of various basic fractions of interest in air pollution studies. Ben(c)acridine, benzo(h)quinoline, acridine, benz(a)acridine, and phenanthridine can be separated and identified in these samples with the help of two-dimensional thin-layer chromatography on silica gel-cellulose (2:1). In addition, a column chromatographic separation of a basic fraction of coal-tar pitch, with silica gel as the adsorbent, was investigated, and the amounts of benz(c)acridine and benz(a)acridine were estimated. Evidence obtained from the absorption spectra indicates the presence of a large number of unknown and previously identified compounds in the fractions. The various silica gel methods are recommended for use in air pollution studies. (Authors' abstract)

05322

MONITORING OF CONTAMINANTS. THE FIRST STEP IN AIR POLLUTION CONTROL. Instrument Development Co., Reston, Va. Feb. 1, 1967. 27 pp.

This paper was prepared in order to contribute to the better understanding of the need for air contaminant monitoring. Included are explanatory remarks on the Clean Air Act of 1963, some histroical considerations on air pollution, lists of sources pollutants, and specifications on air pollution monitoring equipment currently offered by the Instrument Development Company.

05343

Wilson, Donald and Kopcynski, Stanley L.

LABORATORY EXPERIENCES IN ANALYSIS OF NITRIC OXIDE WITH "DICHROMATE" PAPER. J. Air Pollution Control Assoc., 18(3): 160-161, March 1968. 5 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 11-16, 1967. Paper No. 67-199.)

The "dichromate" paper developed by Ripley, Clingenpeel, and Hurn was used successfully in our laboratory for conversion of nitric oxide to nitrogen dioxide at concentrations up to the 1-ppm level. When this paper was used for synthetic mixtures with nitric oxide concentrations in the range of 1-3 ppm, the analyses were erratic and values were lower than calculated. After a number of modification of the procedures for preparing and using the impregnated paper, a modification of the "dichromate" paper was achieved that reduced scatter in the NO analysis and improved conversion efficiency. The efficiency and reproducibility of the modified paper are good enough that efficiency factors may be established to correct data obtained over a period of at least 6-hour continuous use at relative humidities near 50 percent. (Authors' abstract)

05352

Comstock, E. G. and Rue, R. R.

EXPOSURE OF MICE TO NITROGEN DIOXIDE-A CONSTANT PRESSURE SYSTEM. Am. Ind. Hyg. Assoc. J. 22, (1) 33-5, Feb. 1961.

Investigation of the respiratory effects of NO2 requires a methods for delivering a constant known concentration of NO2 into an animal chamber. Continuous delivery of low concentrations of NO2 cannot be accomplished with commonly available gas flow meters. A complaint plastic bag has been incorporated into a closed system designed for exposure of mice to nitrogen dioxide. The plastic bag allows the delivery of a constant concentration of gas at a controlled rate into an animal exposure chamber at nearly constant pressure.

05383

Krilov, N. A.

DETERMINATION OF ETHYLENE OXIDE IN THE ATMOSPHERE. Gigiyena i Sanit. 10, 48, 1961. Russ. (Tr.)

A colorimetric method was developed for the estimation of ethylene oxide in the atmosphere, based on the hydration of ethylene oxide to the ethylene glycol and its subsequent oxidation by periodic acid or potassium periodate to formaldehyde and the determination of the latter with chromotropic acid. The sensitivity of the method is 0.000 5 gm. in 5 ml. It is recommended that ethylene oxide be sampled in 6 ml. of 40 percent H_2SO_4 contained in a U-shaped absorber with a No. 1 porous membrane at a speed of 0.5 l/min. (Author conclusions modified)

05404

P. J. Levy and D. G. Paul

THE APPLICATION OF CONTROLLED PARTIAL GAS PHASE THERMOLYTIC DISSOCIATION TO THE IDENTIFICATION OF GAS CHROMATOGRAPHIC EFFLUENTS. J. Gas Chromatog. 5 (3) 136-45, Mar. 1967.

A technique has been developed for gas chromatographic effluent identification. In the application of this technique, the peak selected for identification is transferred in a continuous flow system, from the primary gas chromatographic unit, through a tubular quartz pyrolysis reactor, and then through a second gas chromatograph for identification of the pyrolysis products. The pyrolysis patterns obtained are characteristic of the parent compound, independent of sample size and constant for the standard pyrolysis condition. Under these standard conditions, the pyrolysis product distribution may be treated in a manner analogous to the mass spectral ion distribution reported as a percentage of total ionization. The pyrolysis product distribution obtained using hexadecane as a test compound agreed very closely with the distribution predicted by the modified Rice free radical mechanism for thermal dissociation. (Authors' abstract, modified)

05548

Lewis, R. J.

FIELD APPLICATION OF DIFFUSION TUBES FOR DYNAMIC CALIBRATIONS. Preprint. (Presented at the 60th Annual Meeting Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-197.)

Simple, inexpensive environmental control systems which were developed for the field use of diffusion tubes to supply a stable, accurate source of calibration gas for sulfur dioxide, and oxides

of nitrogen continuous gas analyzers are described. The results of six months field experiences are presented with comments on and examples of the reliability and utility of the tube system as a calibration technique.

05572

Scott, W. E. and E. R. Stephens

A SCIENTIFIC APPROACH TO THE PROBLEM. Proc. Symp. Cleaner Air Urban Areas, Philadelphia, Pa., pp. 24-35 (1956)

Chemical reactions that take place in a polluted atmosphere produce substances that lend smog its eye-irritating, crop-damaging, visibility-lowering characteristics. The authors relate how, in an effort to identify these reactions and substances, the staff devised the long-path (up to 500 meters) infrared absorption cell. They describe the construction of the cell, and how it is used to detect and "fingerprint" the products of photochemical reactions, both in synthetic and in actual smog. Early work with this new tool was pointed to explaining the characteristic high ozone concentrations of smog, and proceeded from Dr. Haagen-Smit's evidence that nitrogen dioxide reacted with organic compounds in air to produce ozone. They trace the nitrogen dioxide studies that finally led to discovery of Compound X (peroxyacyl nitrite), believed to be the "missing link" in the process of ozone formation in smog. Gasolines and auto exhaust as sources of organic pollutants that take part in NO2 reactions are discussed. They relate their plans for further studies with the infrared cell, and the possibility of applying Los Angeles smog research to other afflicted cities. It may appear that the work reported here is concerned solely with the Los Angeles problem. This is partly true because there air pollution problems in some cities which involve pollutants and weather conditions entirely different from those of Los Angeles. On the other hand, however, many large cities do have pollution sources of the same kind as Los Angeles: power plants, refineries and other industry, incinerators, automobiles, etc. The results of studies of reactions of pollutants from these sources are valid regardless of the city. Weather conditions and topography in the Los Angeles area are such that the products of reactions in the atmosphere frequently accumulate and result in damage and irritation. While conditions for the accumulation of these products occur less frequently in other cities, nevertheless they do occur and the resulting smog is objectionable and costly. With an inversion and no wind, we have a good trap for pollutants from these sources, and as good a chance of having smog as Los Angeles. Plant damage is reported in areas surrounding most large cities of the world. Los Angeles studies show that there are other pollutants besides coal smoke and SO2 that may be objectionable, especially in and around large cities.##

05577

D. M. Gates

INFRARED SOLAR SPECTRAL MEASUREMENTS THROUGH VARYING DEGREES OF SMOG AT LOS ANGELES. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955. pp. 56-71.

The atmosphere even on clear days may be of a rather inhomogeneous character consisting of large clouds of water vapor, or hydrocarbons floating arcund. This detailed structure of the atmosphere may be observed by recording the dispersed energy in the infrared spectrum as received at a spectrometer from a source of energy at a considerable distance. In the experiment reported here the source was the sun. Knowledge concerning the detailed structure of the atmosphere as studied in this manner is meager and it may be that the apparent clouds of CO2 or hydrocarbons in the atmosphere as observed here occur only in the vicinity of large cities. For detailed analysis and identification of the polyatomic constituents of the atmosphere by means of infrared spectroscopy it will be necessary to resort to the use of grating instruments.##

05580

E. R. Weaver and S. Gunther

CONDENSABLE IMPURITIES IN THE AIR OF LOS ANGELES AND VICINITY. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 86-96, (1955).

In the autumn and early winter of 1950 and again in 1951, numerous samples of condensable impurities were taken from Southern California air. The samples were taken by passing air through a filter at the boiling temperature of oxygen. The mass spectra of the condensates were recorded by the Consolidated Engineering Corporation and interpreted, so far as practicable, in terms of chemical composition with the aid of the Consolidated staff. By fractionally evaporating the condensates, determining the constituents of the relatively simple mixtures that came off first, and subtracting the successive patterns of those mixtures from the patterns of the mixtures that came later, about 50 chemical substances were identified in a single sample taken in 1950. Approximately 40 samples were taken in 1951. It was hoped that much could be learned from ther about the nature, source, and distribution of atmospheric pollutants without recourse to such detailed analyses as had been made previously; but the first attempt was unsuccessful. The authors of this paper renewed the attempt to salvage useful information from the very large mass of quantitative data available. This report is a condensed statement of the result.##

05606

A. T. Rossano, Jr. and H. B. H. Cooper

PROCEDURE FOR CALIBRATING A CONTINUOUS NO2 ANALYZER. J. Air Pollution Control Assoc. 13 (11), 518-23 (Nov. 1963). (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

A method is described for calibrating a Beckman K1008 portable analyzer, an instrument for the continuous measurement of low concentrations (parts per million by volume) of nitrogen dioxide

(NO2) in the atmosphere. The apparatus used, reagent preparation, calibration procedures, and limitations and sources of error have been discussed in detail.##

05609

M. P. Sweeney, D. J. Swartz, G. A. Rost, R. Macphee, and J. Chao

CONTINUOUS MEASUREMENT OF OXIDES OF NITROGEN IN AUTO EXHAUST. J. Air Pollution Control Assoc. 14, (7) 249-54, July 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

A pressurization system for conversion of NO to NO2 is described which is a mobile unit capable of continuous sampling and recording of nitrogen oxides in auto exhausts. NO2 absorbs energy in the near UV and blue regions of the spectrum with sufficient strength so as to make colorimetric determinations practical. In addition, if the measurement is made in the neighborhood of 400 millimicrons (blue), cross interferences from other exhaust gas constituents are virtually eliminated. Isolation of the 350-450 millimicrons region may be readily accomplished using a color filter. The possible difficulties arising out of the equilibrium relationship between N2O4 and 2NO2 are greatly diminished since the expected NO concentration will rarely exceed 6000 ppm. From the conversion relationship: $2NO + O2 = 2NO2$ it is seen that the NO2 concentration in ppm will exactly reflect the original NO concentration in the exhaust gas if the oxidation efficiency is 100%. On this basis, with stoichiometric oxygen, equilibrium calculations show that for 1000 ppm NO2, 1% appears as N2O4; for 5000 ppm NO2, 6% appears as N2O4; and for 10,000 ppm NO2, 10% appears as N2O4 (room temp, 1 atm). NO will react with an excess of O2 so that the NO2 concentration as measured will be decreased by a constant dilution ratio which will reduce N2O4 values proportionately. The above analysis was used as the basis for designing a photometer to specifically measure NO2 or oxidized NO in automobile exhaust gas. The sensing instrument is basically a double beam colorimeter which utilizes two voltage regulated tungsten filament sources, two optical cells, and two cadmium sulfide photoconductive detectors. While the colorimeter response is satisfactory, that of the total analyzer system of the prototype must be improved if rapid changes are followed. Potential means for reducing the response time are described.##

05617

Morris, R. A. and R. L. Chapman

FLAME IONIZATION HYDROCARBON ANALYZER. J. Air Pollution Control Assoc., 11(10):467-469, Oct. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The empirical basis for the flame ionization method is the observation that while the flame of pure hydrogen contains an almost negligible number of ions, the addition of even traces of organic compounds produces a large amount of ionization. In practice, the sample to be analyzed is mixed with a hydrogen fuel and passed through a small jet. Air is supplied in the annular space around the jet to support combustion. Any hydrocarbon carried into the flame results in the formation of ions which are accelerated to a collector electrode by an electric field set up between the jet and electrode. The generated ion current is proportional to the rate the hydrocarbon molecules are introduced into the flame. If flow rates are held constant, the ion current is proportional to hydrocarbon concentration. It has been found empirically that the ion current produced in the hydrogen flame is proportional to the heat of partial combustion of the sample (to CO2 and H2O). Therefore, it is possible to construct a table showing the approximate relative contribution which carbon atoms in aliphatic, aromatic, olefinic, acetylenic, and carbonyl molecules will make on the observed signal. Such a table is included. The hydrocarbon analyzer is ideally suited to instrumentation for auto exhaust inspection. In general, it can be used to determine the presence of total hydrocarbons in inert or inorganic gases such as He, A, N2, H2, and air.
Determinations of carbon content in concentrations from 0.1 ppm to 25% are possible with excellent discrimination against water, CO, CO2, and other inorganic gases. The instrument gives equivalent sensitivity for various hydrocarbons, thus it is not selective for mixtures of organic compounds.##

05786

P. W. West and P. Ordoveza

ELIMINATION OF NITROGEN DIOXIDE INTERFERENCE IN THE DETERMINATION OF SULFUR DIOXIDE. Anal. Chem. 34, (10) 1324-5, Sept. 1962.

A slight modification of the West and Gaeke procedure is proposed to eliminate the oxides of nitrogen interference. In the spectrophotometric estimation of sulfur dioxide with hydrochloric acid-bleached pararosaniline hydrochloride and formaldehyde, interference due to oxides of nitrogen was eliminated without complication of the original procedure. Addition of 0.06% sulfamic acid to 0.1M sodium tetrachloromercurate(II) used as absorbing solution for sulfur dioxide from the atmosphere immediately destroys any nitrogen dioxide present. (Author abstract)##

05794

Goetz, A., and Stevenson, H. J. F.

THE AEROSOL SPECTROMETER - ITS THEORY, CONSTRUCTION AND APPLICATION TO ANALYSIS OF EXHAUST AND ATMOSPHERIC AEROSOLS. Proc. Air Pollution Control Assoc., Semi-Ann. Tech. Conf., San Francisco, Calif., 1957. pp. 228-67.

In the study of the constitution and the reaction kinetics of systems consisting of suspensions of discreet particles in gaseous fluids, the most serious limitation is the necessity for precipitating the particles in the submicron range out of the airborne state and separating them according to their diameters. A method which preserves the original physical and chemical status of the formerly suspended particle is thus particularly important for the subsequent evaluation of the true nature of an aerosol. The pattern indicated by the above test results on exhaust and atmospheric smog was summarized as follows: Prior to irradiation, the automobile exhaust consists of a fairly uniform aerosol of particles substantially smaller than 0.2 micron. When a dynamic equilibrium upon subsequent irradiation is reached with regard to the oxidant concentration, the aerosol particles have grown in size, while the total particle number remains of the same order of magnitude. This indicates a nucleation process on some of the aerosol particles which are present in the exhaust prior to irradiation. Nucleation occurs selectively for those HC molecules which have reacted photochemically with NO2 etc. The molecules of the resulting oxidation products are of highly polar nature and therefore have the tendency of condensation on existing nuclei as centers of intermolecular association. The degree of eye irritation produced by the irradiated exhaust parallels the degree of nucleation occurring. Hence the condensate carried on the particles should be a major contributor to the irritation so that their removal, under conditions which do not interfere with the preservation of the condensed state, should substantially decrease the irritation. Unknown at this stage is the nature of the equilibrium between the nucleated and the gaseous phase of these organic oxidants.

05795

Goetz, A., and Stevenson, H. J. F.

THE ANALYSIS OF AEROSOLS WITH THE AEROSOL SPECTROMETER. Air Pollution Control Assoc. Proc., Semi-Ann. Tech., San Francisco, Calif., 1957. pp. 268-72.

The Aerosol Spectrometer permits the separation of particles from an aerosol by exposing the latter under laminar flow conditions to strong centrifugal forces. This is accomplished by leading the flow at low Reynold Numbers through a helical channel, located at the periphery of a cylindrical or conical rotor which is spinning around its polar axis with 18,000 to 25,000 rpm, exposing the aerosol to a centrifugal acceleration of about 18,000 to 30,000 g. The particulate matter is deposited on the outer wall of the helical channel which is removable and renders the deposit after each test available to microscopic or analytic procedures. Under these conditions the particle concentrate on the wall is classified according to size, inasmuch as the large particles are deposited near the channel inlet, the smallest near the outlet. The evaluation procedure consists of taking microscopic counts at defined areas along the channel wall by a method which includes particle diameters. The evaluation of the numerical size distribution of the aerosol deposit is mathematically discussed. The findings on studies of automobile exhaust and atmospheric smog with the spectrometer are discussed in terms of nucleation of the particles, and eye irritation.

05797

Benzetti, N. A., and Doyle, G. J.

ELECTRONIC LIGHT SCATTERING AEROSOL ANALYZER STUDIES OF AIR POLLUTION. Proc. Air Pollution Control Assoc., Semi-Ann. Tech. Conf., San Francisco, Calif., 1957.

There is a need for rapid and continuous measurement of time dependent variables for the detailed study of aerosols associated with air pollution. To help meet this need the Air Pollution Foundation has developed an electronic counter photometer. It is presently being used for the study of aerosols produced by irradiation of diluted automobile exhaust. A brief description of the instrument is given, followed by discussion of work on the atmosphere and interpretation of the results. The predicted utility of the counter-photometer for pollution work was confirmed by experience during this study. If the resolution of details given by the counting function is not desired, the probable utility of 90 degree scattering as a simple particulate and visibility index has been demonstrated for the size distribution encountered during smog attacks. The instrument will be useful in further studies of this sort having greater statistical validity.

05836

H. P. Clark

EVALUATION OF MICROBIOLOGICAL SYSTEMS FOR ESTIMATING AIR POLLUTING SUBSTANCES. Preprint. (1957).

The procedure used in the evaluation of microbiological systems for estimating air polluting substances consisted of: (1) Placing an indicator organism on a membrane filter strip in a logarithmic increasing concentration; (2) Exposing the bacterial indicator on the surface of the strip to a synthetic aerosol (irradiated automobile exhaust) at a flow rate for the aerosol of 5/min with the strip moving 7.8 mm/mm; (3) cultivation of the remaining viable bacteria on the strip after aerosol exposure by incubation on an appropriate medium at 35C for 18-20 hrs; and (4) Comparison of the bacterial colony density on the exposed strip with suitable control strips to estimate the growth inhibiting property of the aerosol under examination. A recently isolated E. coli. was used as an indicator. The procedure appears to have valuable application in the study and comparison of exhaust before and after irradiation. The concentrations of hydrocarbons in some of the experimental tests were in the range of those which might occur on a street during heavy motor vehicular traffic. The test procedure has sufficient merit to justify further development work on methodology, interpretation and application.##

05837

E. W. Cieplinski and L. S. Ettre

A NEW SIMPLIFIED DETECTOR FOR THE ANALYSIS OF ORGANIC IMPURITIES IN ATMOSPHERE AND EXHAUST GASES. Preprint. (Presented at the Joint Symposium on Air Pollution

Instrumentation, Instrument Society of America and Air Pollution Control Association, New York City, June 12-13, 1961.)

The Model 223 Flame Ionization Analyzer is a 117-volt, 60-cps, line-operated instrument. It measures 10 1/4 inches on a side and weighs about 25 pounds. A meter located on the front of the instrument indicates the organic vapor concentration of the sample. Since different classes of organic compounds give a different detector response, the meter indication for a given sample must be interpreted on the bases of instrument calibration with an appropriate test gas. Output connections are provided for using the instrument with a standard 0-5 or 0-10 millivolt, potentiometer recorder. Hydrogen, air, test gas, and zero gas supplies are necessary for operation. Filters containing 5-A Molecular Sieve mus should be used to remove any small impurities present in the air and hydrogen. The test gas contains a known concentration, in the same order of magnitude as the sample, to permit the proper calibration of the panel meter. The zero gas is the same as the background gas of the sample and is usually only necessary when the higher sensitivity ranges are being used. The gas is used to check and eliminate any effect the background gas may have on the flame detector operating parameters. The instrument will continuously monitor organic impurities in the atmosphere and exhaust gases. The unit is transportable, line-operated, and is very stable. Samples may be introduced in the range of 35-75 millimeters of mercury pressure when external regulation is used and between 0.4-9.5 liters per minute when the instrument's back pressure regulator is used. The linearity of response for the detecting system has been shown to be very good over a wide range of concentrations ##

05866

R. E. Rostebach and R. G. Kling

NITROGEN DIOXIDE DETECTION USING A COULOMETRIC METHOD. J. Air Pollution Control Assoc. 12 (10), 459-63 (Oct. 1962). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

The toxic level presence of NO2 in any working area is an industrial hygiene problem, and its unwatned presence in any area may present an air pollution problem. The adaptability of the Mast Model 724 Series Meter for the monitoring of NO2 HAS been demonstrated. The Mast Nitrogen Dioxide Meter is based upon a coulometric system. A chemical solution containing the proper amounts of reagents is pumped into the sensor. The solution flows in a thin film down the electrode support, upon which are wound many turns of a fine platinum wire cathode and a single turn of a platinum wire anode, and is deposited in the waste reservoir. The air sample enters through the air inlets, is drawn into the sensor by way of the narrow annulus where it comes into intimate contact with the solution contained on the electrode support, and exits by means of air pump. The instrument requires only 115-volt, 60-cycle power supply and a small 1.34-volt mercury battery. A battery-operated portable unit was developed for NO2 measurements at locations where an external power supply is not

available. Operating characteristics of the microcoulomb sensor are: (1) A fixed dc voltage applied across the sensor cathode and anode; (2) The chemical solution flows over the electrodes at a fixed flow rate (1.25 ml/hr typical for O3 meters and 2.5 ml/hr typical for NO2 meters); (3) The gas sample containing an oxidant to be measured flows through the sensing cell at a fixed flow rate (140 ml/min typical for ground level applications). The response time of a sustained level of 2000 ppm of NO2 is 50% of full reading in 0.2 min, 88% in one min, and full reading response occurs in less than 5 min. The detector recovers in less than 12 sec. after removal of NO2. Recovery down to 20% of an actual concentration reading occurs in less than 60 sec. Full recovery occurs in less than 5 min.##

05892

J. C. Ivie, M. D. Thomas, O. C. Taylor, C. R. Thompson, , W. E. Dugger, Jr., B. L. Richards

RECORDING THE RESPONSE OF PLANTS TO VARIOUS AIR POLLUTANTS. J. Air Pollution Control Assoc. 13 (8), 355-9 (Aug. 1963). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

This paper is an outline of experimental procedures and instrument methods employed to measure effects of the air pollutants, fluorides, ozone, and peroxyacyl nitrates (PAN), on citrus trees. The plan calls for the operation of at least three experimental test sites on which 24 citrus trees in plastic enclosures are given six treatments as follows: A - "Clean air," B - "Ambient air," C - "Fluoride-free" air, D - "Ozone-free" air, E - "Clean air" with fluoride added, and F - "Fluoride and ozone free" air. Two test sites on lemon trees are in operation at Upland and Cucamonga, California. A third site on Naval orange trees is under construction at Upland, California. Photosynthesis and transpiration measurements are used to supplement long-term growth and yield observations. Inlet and outlet air samples are accumulated in bags for one-half hour periods. The difference in humidity and carbon dioxide is then measured sequentially from the air in the bags. Automatic punchcard recording is provided for plot samples and for the ambient air pollutants which consist of: dioxide, nitric oxide, ozone, total oxidants, and fluorides. These are recorded together with the date, time, temperature, and an integrated value for sunlight. Four IBM cards are punched each hour with positive identification of the data sources both from the punch position and card reference number. Activated charcoal and limestone filters are used to remove oxidant and fluoride phytotoxicants, respectively, from the air entering the plots. The average concentration of fluoride occurring on one day is used to set the hydrogen fluoride concentration metered into the four plots receiving this treatment on the following day. Nitric oxide is diluted 1 to 50 with nitrogen and is metered to four plots in 0.05 ppm steps during the day as the oxidant level increases to react with and inactivate ozone as a phytotoxicant. Twice the stoichiometric amount of NO is used as the level of total oxidants, i.e., for 0.1 ppm total oxidant 0.2 ppm NO is added.##

05915

A. P. Altshuller, C. A. Schwab

COLORIMETRIC DETERMINATION OF ALKYL NITRITES. Anal. Chem. 31, 314-5, Feb. 1959. (Presented at the Air Pollution Symposium of the Division of Industrial and Engineering Chemistry, 132nd Meeting, American Chemical Society, New York City, Sept. 1957.)

As alkyl nitrites react with the reagent (Saltzman procedure) used to determine NO2 in laboratory and field operations it appeared of interest to determine the reactivity of the alkyl nitrites directly without also having to consider absorption efficiencies. The amount of reaction on micromole basis of n-butyl nitrite, t-butyl nitrite, n-amyl nitrite, and i-amyl nitrite was determined for comparison with the reactivity of NaNO2 and NO2. The concentrations used ranged between 0.07 and 0.7 micromoles per 10 ml. of solution. The reproducibility of the results obtained ranged from + or - 5 to + or - 10 percent. The values obtained are tabulated in terms of optical density per micromole of alkyl nitrite compared with that for sodium nitrite. It has been shown previously that the reactivity of NO2 compared with inorganic nitrite is in the ratio of 0.72 to 1. The tabulated values show that the alkyl nitrites investigated react at least to the same extent as NO2 and generally more so. Distillation, particularly vacuum distillation, increases the indicated reactivity through improved purity of the alkyl nitrites. The results obtained indicate that the method used for NO2 is not specific to NO2 but responsive to all compounds, inorganic and organic, containing the O - N - O group. The solutions for the colorimetric determinations were prepared by dissolving one ml. of the appropriate alkyl nitrite in 75 ml. of glacial acetic acid and diluting to 250 ml. with distilled water. One ml. of this solution was diluted to 100 ml. with distilled water to make the necessary solutions in the microgram range. The analytical determinations were made on a Beckman Model DU Spectrophotometer using the procedure described by Saltzman.##

05952

Pyazanov, V. A.

A SUMMARY OF 1961 STUDIES IN THE FIELD OF LIMITS OF ALLOWABLE CONCENTRATIONS OF ATMOSPHERIC AIR POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants. Book 7.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9, pp. 138-41. (1963). Russ. (Tr.)

The Committee for the Sanitary Protection of Atmospheric Air approved limits of allowable concentrations in the air for the following new substances: furfurol, dimethylformamide and styrol. Furfurol is a heterocyclic aldehyde which is a good solvent for many organic substances used in the preparation of some plastics

and a selective solvent for the purification of crude oil lubricants. The threshold of aldehyde odor perception in most sensitive persons was established at 1 mg/cu m. It was determined that 0.05 mg/cu m of furfurol constituted the subthreshold concentration in all the tests erplcyed. Therefore, 0.05 mg/cu m of furfurol was accepted as the maximal single allowable concentration. Styrol is a benzene homologue with one double bond at its side chain. The maximal single allowable concentration of styrol in the atmospheric air was suggested as 0.003 mg/cu m. Dimethylformamide is a colorless liquid having a nauseating herring odor; it is used as a polyacrylnitryl solvent in the synthetic fiber industry known as orlon and nitron. It was recommended that 0.03 mg/cu m be adopted as the limit of allowable single and 24 hour concentration of dimethylformamide vapor in the air, since it proved to be the subthreshold concentration in relation to all the test indexes. The limit of allowable phenol concentration in atmospheric air was set at 0.01 mg/cu m. Rats were exposed to the inhalation of nitrogen dioxide 6 hours daily for 164 days at different dose levels. No maximum allowable concentration was agreed upon.

C6050

D. F. Adams

OZONE ANALYSIS WITH THE MINI-ADAK II. J. Air Pollution Control Assoc. 13, (2) 88-90, Feb. 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

The suitability of sodium diphenylaminesulfonate (NaDS), potassium iodide, and phenolphthalein reagents for ozone analysis in a multipurpose, automatic analyzer such as the Mini-Adak II was investigated. The oxidation potential for NaDS is more negative than that for iodine and, therefore, NaDS is believed less susceptible to oxidative interference as a colorimetric reagent. The reagents were prepared along with a mixture of ozone and oxides of nitrogen. The test atmosphere was drawn through a single manifold and thence to two midget impingers in parallel, one containing 10 ml of the neutral KI reagent and the other 10 ml of either the NaDS or phenolphthalin reagent. A second series of comparisons was made between a midget impinger containing neutral KI and the Mini-Adak II utilizing the NaDS or phenolphthalin reagent. Based on the literature and the work herein reported, either the phenolphthalin or NaDS reagents can be used in the Mini-Adak for ozone analysis. Selection of the reagent to be used should be based upon an evaluation of the possible interferences which may be present with ozone in the atmosphere and the relative sensitivities (molar absorbancy) of the two reagents. Either reagent shows only one-fourth as much response to NO2 neutral KI and is therefore superior to KI in this respect. Based on the laboratory study, the phenolphthalin reagent appears somewhat preferable for use in the Mini-Adak. This selection is tentatively made upon the basis of the greater sensitivity (molar absorbancy) of the phenolphthaline which permits the use of a lower Mini-Adak sensitivity range with its attendent reduction in electronic background noise.##

06107

Gilardi, E. F. and R. M. Manganelli

A LABORATOR STUDY OF A LEAD ACETATE-TILE METHOD FOR THE QUANTITATIVE MEASUREMENT OF LOW CONCENTRATIONS OF HYDROGEN SULFIDE. J. Air Pollution Control Assoc. 13, (7), 305-9 (July 1963). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

Laboratory studies of factors influencing the quantitative use of a lead-acetate-tile method for H2S were undertaken. These studies included the preparation of H2S test atmospheres, the determination of the darkening effect of these atmospheres on lead-acetate-coated tiles, and investigations on the stability of the PbS color produced. The following conclusions resulted: (1) |Exposure Units,| which is the product of H2S concentration and exposure period, mg.hr/cu m, is a useful parameter in representing H2S exposure. A regression equation utilizing this parameter accounts for 98.6 percent of the variation in absorbance values. (2) Average concentrations of H2S between 0.15 and 1.5 mg/cu m can be determined by the measurement of the surface absorbance of a lead-acetate coated tile. The standard error of estimation was plus or minus 0.01515 absorbance units in a laboratory-prepared darkening curve. (3) The tile-darkening curve was approximated by a parabola. A distinct maximum in absorbance was also observed in tile darkening data. (4) Whether or not a tile absorbance value within the usable range is on the ascending, defined portion of the darkening curve may be determined by a consideration of the reflectance spectrum of the particular tile. (5) The darkening effect of a given exposure to H2S was increased by increased air turbulence. (6) Methyl mercaptan, dimethyl sulfide, and dimethyl disulfide, in concentrations much higher than normally present in the outdoor atmosphere, had no significant effect on the H2S sulfide darkening of lead-acetate-coated tiles. (7) Fading of darken tiles was accelerated both by air turbulence and light. (8) Periods of exposure of lead-acetate-coated tiles are limited by H2S concentration level and fading of the PbS color. The higher the H2S concentration, the smaller the exposure period which will result in a surface absorbance beyond the usable range. The fading in a louvered, light-proof chamber places an upper limit of approximately 8 hr. on outdoor exposure periods. (authors' summary modified)

06112

Tada, O.

MEASUREMENT OF AIR POLLUTANTS. Bunseki Kagaku (Japan Analyst) (Tokyo) pp. 110R-7R. 1966. Jap.

Important papers published in Japan Analyst in 1964 and 1965 are summarized. The subject is limited to measurement methods of air pollutants known to be toxic to health. Pollutants from stacks and automobile exhausts are covered, including many cyclic hydrocarbons, aldehydes, sulfur oxides, nitrogen oxides, ozone,

carbon monoxide, carbon dioxide, fluorine compounds, hydrogen sulfide, lead compounds, and offensive odors. Various sampling methods are described, especially using filtering with glass wool filters, electric dust collectors, gas absorbers, and portable samplers containing silica gel. The pollutants can be measured by electroconductivity methods, colorimetric measurement recorder, gas chromatographic analysis, electron capturing detector, and hydrogen ion detector. The papers summarized do not include those dealing with industrial or occupational environment or mining.

06279

K. E. Ball

DEVELOPMENT OF AN ATMOSPHERIC MONITORING SYSTEM (FINAL REPT. JUNE 12, 1958-JUNE 30, 1961). (Mine Safety Appliances Co., Pittsburgh, Pa., Research and Engineering Division.) (1961). 45 pp. (Rept. No. MSA 301825.)

Atmospheric monitoring devices sensitized to continuously detect and record toxic and higher concentrations of HF, F2, B5H9, N2H4, NO2 and C1F3 (missile fuels and oxidizers) have been developed and engineered. An ionization type analyzer sensitive to finely divided aerosols is used as the detecting instrument. Various amine and acid reagents are used to convert the oxidizers and fuels respectively to aerosols. Response times are in the order of seconds and a high degree of specificity has been attained. (Author's abstract)##

06301L

MECHANISMS OF AIR POLLUTION REACTIONS. (Section VIII of Air Pollution Research Progress Report for Quarter Ended December 31, 1966.) Bureau of Mines, Pittsburgh, Pa., Coal Research Center, 1966, pp. BM/69-BM/76.

The NOx-sensitized photooxidation of 2-methyl-1-butene was investigated. Yields with regard to the reaction production formaldehyde, methyl ethyl ketone, PAN, PPN, nitrates and CC were determined. The study of the NOx-sensitized photooxidation of tagged ethylene in the presence of other hydrocarbons was terminated. Results indicated that (u) the photochemical reactivity of ethylene in mixture with other hydrocarbons varies with change in the mixture composition, and (2) the variation is unpredictable at the present time. (Author summary)##

06319

J. H. Espenson, H. Taube

TRACER EXPERIMENTS WITH OZONE AS OXIDIZING AGENT IN AQUEOUS SOLUTION. Stanford Univ., Calif., Dept. of Chemistry.

(Jan. 11, 1965). 21 pp. (Technical Rept. 2.) (Contract Nonr. 225(63)) (Task NR 052-443.)
CFSTI, DDC: AD 613484

The results of experiments done to trace the path of oxygen in reactions of ozone with a number of reducing agents are described. The reducing agents dealt with in this study are sulfite (sulfur dioxide) and nitrite ion which react with ozone in homogeneous solution, and Mn(plus 2) and Ti(plus) which were studied under conditions so that the solid products, manganese dioxide and hydrous thallic oxide, are formed. Tracer studies on the reaction of Mn(plus 2) with MnO(minus 4) are also described. When ozone reacts with sulfur dioxide in aqueous acid solution, as many as two ozone-oxygens appear in each product sulfate ion. In alkaline solution transfer in excess of one O for each sulfite ion is observed and some of the sulfate oxygen is derived from the solvent despite the fact that sulfite ion is not a labile species under these conditions. Ozone induces exchange between sulfate ion and water both in alkaline and acidic solution, but the reaction is so slow as not materially to affect the results which have been described. By contrast the isotopic course of the reaction of nitrite ion with ozone in alkaline solution is simple; the nitrate ion contains two oxygens derived from the nitrite, and one drived from the ozone. (Author abstract) ##

06352

R. P. DeGrazio and R. G. Auge

GAS CHROMATOGRAPHIC INVESTIGATIONS FOR THE DETERMINATION OF FLUORINE AND OXYGEN IN MIXTURES. Dow Chemical Co., Golden, Colo., Rocky Flats Div. (Rept. REP-880) (Apr. 12, 1967). 10 pp.
CFSTI: RFP-880

This report describes various methods investigated for the determination of fluorine and oxygen in gas mixtures by gas chromatographic techniques. The technique found to be successful involves the quantitative conversion of fluorine to chlorine by the reaction with sodium chloride and the subsequent separation and detection of chlorine and oxygen. (Author abstract) ##

06369

Samuel G. Booras, and Charles E. Zimmer

A COMPARISON OF CONDUCTIVITY AND WEST-GAEKE ANALYSES FOR SULFUR DIOXIDE. J. Air Pollution Control Assoc., 18(9): 612-615, Sept. 1968. 3 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-109.)

A comparison of the two most common methods used by air pollution control agencies for the analyses of sulphur dioxide is discussed in this paper. Samples were collected simultaneously (502 pairs) for an eight month period at eight sites in the

City of Chicago, using the West-Gaeke and conductivity methods. These methods are analyzed statistically to ascertain the existence of a factor describing adequately any differences between methods. At a first look of the gross data, it would appear that at least for the City of Chicago, the conductivity measurement for SO2 tends to yield a higher estimate than the West-Gaeke method by a factor of approximately 20%. On the basis of this number alone one would reach an incorrect conclusion because looking at the similar measurements of West-Gaeke's and conductibity by stations you see that the comparison of the two methods is not consistent, over all the stations. In fact, in some cases the West-Gaeke method appears to yield higher results than the conductivity, which now is contradictory to the average of all the stations. In the final analysis, however, it is apparent that both the measurements of conductivity and West-Gaeke are subject to interferences from other substances in the atmosphere. The conductivity values may in fact be under-estmates because of the presence of ammonia in the atmosphere and the West-Gaeke measurements may also be under-estimates because of the presence of NO2 in the atmosphere. Until such time as one can look into the other interferences with the appropriate data, no conclusion as such can be drawn relating in any precise manner to conductivity and West-Gaeke methods for measuring SO2. (Author abstract, Author conclusions)##

06385

Palgout, D. A. and C. I. Harding

DETERMINATION OF H2S EXPOSURE BY DYNAMIC SAMPLING WITH METALLIC SILVER FILTERS. J. Air Pollution Control Assoc., 18(1):15-20, Jan. 1968. 24 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967.

This paper describes a method of determining exposure to H2S and mercaptans by measuring the decrease in reflectance of Ag membrane filters resulting from the formation of Ag2S on the filter surface. SO2, $(CH_3)_2S$ and $(CH_3)_2S_2$ do not react with the silver membrane. The method depends on the reaction between metallic Ag and H2S: $H_2S + 2Ag + 1/2\ O_2$ yields $Ag_2S + H_2O$. Mercaptans also react with Ag in a similar manner. An appropriate surface, an excess of O2 and a condensed water film are necessary for these reactions to proceed rapidly and quantitatively. The NO2 concentration is significantly reduced by Ag membrane filters. Results indicate the oxidation of Ag2S to Ag_2SO_4 by O3 is slow and that the reflectance loss of clean Ag filters caused by O3 is small. There is little opportunity for UV light to affect the Ag membrane if the filter holders are taped. Three 23 hr. samples/wk were taken at a flow rate of 0.9 lpm. Under these conditions the reflectance losses ranged from 0-37 reflectance units/cu m of sampled air. The Ag filters appear to be more sensitive to sulfide gases at high humidities. This tends to enhance the value of the method as a measure of non-health effects, such as paint sensitivity.##

06388

B. I. Garland

A SELF-MADE MOBILE AIR SAMPLING LABORATORY. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-191.)

Fulton County, Georgia, developed a practical, economical and efficient mobile laboratory to sample the air for gaseous and solid components and to obtain basic weather data. A self-supporting trailer lab complete with power and necessary equipment and pulled by a half ton pickup truck was put in service. The total cost of trailer, equipment and truck was about $4500. Air is pulled by means of a vacuum pump through sampling ports in the roof, bubbled through absorbing reagents and/or filter material and measured immediately for pollution characteristics by use of a colorimeter and a standard curve. A trailer was factory built according to submitted specifications, fitted with a portable generator and air conditioner and equipped with adequate sampling equipment. All power and heat were derived from L P gas from tanks attached to the unit. Results were satisfactory. The unit provides a rapid and versatile means of obtaining vital information, upon demand, in any location. Air constituents measured include: oxidant, SO2, NC, NO2, CO, COH, particulate matter and pollen.
Weather observations include: temperature, relative humidity, wind speed and direction, visibility and sky conditions.
(Author"s summary)##

06406

V. Marchesani

THE MEASUREMENT OF AIR POLLUTION BY MEANS OF FUNGAL GROWTH. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-157.)

In the past years fungi have been considered as air pollutants rather than as recipients of air pollution. Fungi, however, being a living air pollutant, are also subjected to all the growth discomforts of a polluted atmosphere. Occupying the air from ground level to approximately one mile above the earth, their direct contact with air pollutants is obvious. The effect of pollutants on the metabolic processes and growth rate of the fungi has received very little, if any attention. The fact that certain fungal plant diseases will occur in non-polluted air and not in polluted air points out the reality that some relationship between air pollution and fungal metabolism exists. A definite negative correlation between fungal growth and high nitric oxide concentration in the atmosphere was found in this study. The total growth of fungi with purified air was two to three times as much, on a dry weight basis, as that of fungal growth subjected to air pollution. It is felt that further study in this field could bring about the use of fungi as an analytical tool in the measurement of the effects of air pollution. (Author abstract)##

06433

Singh, T., R. F. Sawyer, E. S. Starkman, and L. S. Caretto

RAPID CONTINUOUS DETERMINATION OF NITRIC OXIDE CONCENTRATION IN EXHAUST GASES. J. Air Pollution Control Assoc., 18(2):102-105, Feb. 1968. 8 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-151.)

A continuous sampling, continuous analysis method for measuring nitric oxide was demonstrated. Rapid oxidation of nitric oxide to nitrogen dioxide is obtained through ozonation. Nitrogen dioxide concentrations are determined by means of an ultra-violet absorption technique. Nitric oxide concentrations between 100 and 5000 ppm have been measured and response times of about 20 sec obtained. The presence of unburned hydrocarbons in the exhaust sample has an adverse effect on the results of this technique which requires either the removal of hydrocarbons or adjustment of ozone concentration. (Authors' abstract, modified)##

06435

Smith, D. S., R. F. Sawyer, and E. S. Starkman

OXIDES OF NITROGEN FROM GAS TURBINES. J. Air Pollution Control Assoc., 18(1):30-35, Jan. 1968. 6 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967.)

Experimental and theoretical studies were made to provide information on nitrogen oxide concentrations produced by gas turbine engines. Nitric oxide concentrations of from 100 to 350 ppm, adjusted to stoichiometric conditions, were measured in aircraft turbojet engines. Concentrations of less than 50 ppm, similarly adjusted, were measured in a 60 hp industrial gas turbine. Concentrations of about 100 ppm, also adjusted, were measured in a laboratory combustor of a design similar to gas turbine combustors. Carbon monoxide and unburned hydrocarbon concentrations also were determined. Comparison with predicted equilibrium concentrations shows strong departures from equilibrium. (Authors' abstract)##

06460

M. D. Thomas and J. O. Ivie

SIMULTANEOUS MEASUREMENT OF OZONE AND OXIDES OF NITROGEN. Preprint. (1960.)

This paper describes a modification of the Griess diazo-reaction method by which ozone can be determined specifically. The gas phase reaction between ozone and nitric oxide to form nitrogen

dioxide is extremely rapid. The half-life at 1 ppm is 1.8 seconds and 18 seconds at 0.1 ppm. The corresponding half-lives of the NO2-O3 oxidation are listed at 8 and 80 min. respectively. Evidently NO and ozone cannot coexist in the atmosphere. One compound or the other will disappear rapidly even at concentrations found in polluted air. If ozone is present, it can be determined by adding an excess of NO to a sample of the air, allowing a short time for reaction, then finding the increase in NO2 concentration as compared with the untreated air. For this purpose it is only necessary to add a third identical absorber system to the automatic analyzer for NO and NO2 together with accessory equipment to supply the required NO. NO2 when absorbed in this solution (0.5 sulfanilic acid, 5 percent acetic acid and 50 ppm N-(1 naphthyl)-ethylene) diazotizes the sulfanilic acid and reacts with the coupling reagent to produce an intensely colored red azo dye. The latter is read in a recording colimeter. NO has no effect on the reagent and HNO3 does not interfere except at unrealistically high concentrations. All absorbed nitrites react quantitatively. However NO2, which theoretically should give a 50% yield of nitrous acid, actually gives a 82% yield in fitted glass absorbers or a 90% yield in absorbers with stainless steel spirals. Empirical calibration with known amounts of NO2 is therefore necessary. A diagram of the automatic NO2-NO-O3 analyzer is included.##

06471

H. W. G. Wyeth and G. W. Timmins

DETECTION AND MEASUREMENT OF INFLAMMABLE VAPOURS IN AIRCRAFT. Ministry of Aviation, Farnborough Hants, England, Royal Aircraft Establishment. (Rept. No. 65191.) (Sept. 1965). 74 pp.
DDC: AD477 232

A study is made of the feasibility of detecting and measuring concentrations of inflammable vapour within compartments of aircraft in flight. The basic requirements are outlined. A review is made of properties of inflammable vapours that might be exploited. Mention is made of some existing instruments and techniques, and their limitations for the present purpose are discussed. Especial emphasis is given to techniques of catalytic combustion and ionization which with further development are thought likely to be suitable. (Author summary)

06507

Call, Roger W., E. Paul Palmer, and Richard W. Grow

MEASUREMENT OF ATMOSPHERIC AEROSOLS BY POLARIZED-LASER LIGHT SCATTERING. Utah Univ., Salt Lake City, Microwave Device and Physical Electronics Lab., Grant NSF-GP-874, UTEC MD-67-034, NSF-TR-11, 127p., June 1968. 73 refs.
DDC: PB-185688

A new method of taking aerosol measurements using scattered light from a laser beam fired into the atmosphere was developed and

tested. The method developed uses measurements of light scattered from a polarized laser beam to find the aerosol attenuation coefficient, the aerosol number density and the aerosol size distribution. The method was tested by making measurements from a secondary site distant from the laser transmitter. Result are plotted for attenuation coefficients up to 30 kilometer in altitude. Mie scattering functions specifically for use with polarized light beams were computed for various aerosol size distributions. Theory is developed for making two-station backscatter measurements usin a pulsed ruby laser as a light source. The rayleigh and Mie scattering functions are applied to the geometry of the problem, and by considering the polarized properties of the laser beam a simplified scattering equation is developed. By taking two scattering measurements at any given altitude, using different angles of polarization of the laser beam for the separate measurements, troublesome variables are eliminated from the scattering equations. Effects of beam attenuation losses on the transmitting and scattered light paths were eliminated from the equation solution, as were constant involving receiver efficiency, transmitted power, beam divergence, etc. The final solution to the equation for aerosol attenuation coefficients depends only on the angular functions for Rayleigh and Mie scattering and upon the relative voltage responses at the distant receiver for the two separate measurements taken at each altitude. The calculations for any given altitude are independent of those for any other altitude.##

06520

E. W. Norell and J. D. Zeff

INHALATION AEROSOL DOSIMETER (FINAL REPT. DEC. 22, 1961 - MAY 15, 1963). General American Transportation Corp., Niles, Ill., MRD Div. (Rept. MRD 1181-70.) (June 1963) 9 93 pp.

The objective of this program was to develop an instrument that would continuously measure and record the amounts of aerosols that are retained by man within his respiratory tract in the course of breathing aerosol laden air. An Inhalation Aerosol Dosimeter (IAD) that meets all the requirements set out in the contract was developed by the MRD Division of General American Transportation Corporation. The overall construction of the IAD parallels the design suggested in the original proposal. The major modification of that design is that hydrogen flame ionization principle is used for detection and monitoring of the aerosol concentration, and the secondary modification consists of developing a very precise aerosol sampling system. The sampling system is based upon maintaining precise (reduced) pressure within the detector so that actual sampling is a truly continuous process.##

06599

K. W. Wilson and H. Buchberg

A CONTROLLED ENVIRONMENT SYSTEM FOR AIR POLLUTION STUDIES. Preprint. (Presented at the 51st Annual Meeting, Air

Pollution Control Association, Philadelphia, Pa., May 25, 1958, Paper No. 58-54.)

The objective of this study was to design, construct, and validate a controlled air environment system with limited capital expenditure which would offer flexibility in the areas of experimentation mentioned and in the further elucidation of design parameters concerned with the simulation of the natural air environment. Four very important areas of experimentation in air pollution are: 1. The determination of the effects resulting from the exposure of humans, animals, plants, and materials to an air environment polluted by different substances in various amounts. The identification of substances from various sources of pollution responsible, directly or indirectly, for various deleterious effects, and the determination of the amounts of these substances that must be removed to prevent or minimize these effects. 3. The evaluation of pollution control measures in terms of the actual effects produced. 4. The investigation of reaction mechanisms in the polluted air environment. The controlled air environment system described was constructed and is being developed. In addition to a discussion of the design features, preliminary experiments utilizing the system are presented.##

06613

B. E. Saltzman

COLORIMETRIC MICRODETERMINATION OF NITROGEN DIOXIDE IN THE ATMOSPHERE. Anal. Chem. 26 (12), 1949-55 (Dec. 1954).

A new specific reagent has been developed and demonstrated to absorb NO2 efficiently in a midget fritted bubbler at levels below 1 ppm. The reagent is a mixture of sulfanilic acid, N-(1-naphthyl)-ethylene-diamine dihydrochloride, and acetic acid. A stable direct color is produced with a sensitivity of a few parts per billion for a 10-minute sample at 0.4 liter per minute. Ozone in fivefold excess and other gases in tenfold excess produce only slight interfering effects; these may be reduced further by means which are described. (Author abstract modified)##

06642

C. F. Ellis

A SUGGESTED PROCEDURE FOR CONVERTING NO IN LOW CONCENTRATIONS TO NO 2 (TECHNICAL NOTE). Intern. J. Air Water Pollution, 8 (5), 297-9 (1964).

A modification of the Saltzman method in making analysis of gases containing low concentrations of NO & NO2 is described. The procedure involves use of fiber glass filter paper on which an oxidizing solution of acidified KMnO4 has been evaporated. This oxidant preparation readily converts NO to NO2 in low concentrations, apparently without loss, permitting the well-known

colorimetric determination of O2 to be applied to the determination of NO and NO2 separately. In this test the total concentration of NOx should only range from 1 to 5 ppm. Gases containing higher concentrations of NO and NO2 however, possibly could be handled without a dilution step, but this has not been demonstrated. Inasmuch as the procedure as now defined is limited to low concentrations of NO, automobile exhaust gases must be diluted with nitrogen to an appropriate concentration. Moreover, it is necessary that the dilution be made immediately after the exhaust sample is drawn.##

06800

M. Terabe and M. Ichihashi

A STUDY ON THE METHOD FOR MEASUREMENT OF FLOATING DUST PARTICLES BY HI-VOL SAMPLER. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 4, (3) 56-62, 1966. Jap.

In 1965 an experiment was carried out in the business section of Kawasaki in order to compare the two high-volume air samplers. The one, the Staplex Hi-Vol Sampler, using the Gelman A glass fiber and constructed so that the collecting face is perpendicular to the direction of the wind, is widely used in Japan. The other was a type used by the National Air Sampling Network (NASN) in the United States, made by the General Metal Works. In this sampler, the collecting face is set parallel to the wind and sampling is performed under shelter. Analyses were carried out for sulfate ion, nitrate ion, and benzene-soluble organic matter in the air. Tables and graphs tabulate the values obtained using both kinds of sampler; average values differed by approximately 5%. The Staplex Sampler was more effective in collecting floating dust and organic matter (large particles) and the General Metal Works Sampler handled sulfate and nitrate ions (small aerosol particles) more efficiently.##

06832

M. Fugas, and M. Gentilizza

EFFECT OF NO2 ON SO2 DETERMINATION USING PARAROSANILINE. Proc. Intern. Congr. Occupational Health, Vienna, 1966. pp. 385-8.

Among various methods used for the determination of SO2 in the air, the procedure after West and Gaeke involving sampling in sodium tetrachloromercurate and colorimetric determination with pararosaniline has found widest application being the most specific and sensitive method in use. The literature data concerning the extent of NO2 interference in this method are limited. In this investigation, the interference of NO2 in the determination of SO2 was studied in chemical solutions of NO2 - and SO3--, in samples of laboratory prepared gas mixtures and in the outdoor atmosphere. Test results indicated that a definite amount of NO2 interferes in the SO2 determination decreasing the

obtained SO2 values as follows: by the same absolute amount irrespective of the actual SO2 concentration; by the same percentage irrespective of the actual SO2 concentration; by the amount depending on the SO2/NO2 ratio. (Author abstract modified)##

C6889

Antoshechkin, A. G.

INSTRUMENT FOR DETERMINATIONS OF THE CONCENTRATIONS OF NITROGEN OXIDES AND NITRIC ACID FUMES IN AIR. (Pribor dlya opredeleniya kontsentratsii okislov azota i parov azotnoi kisloty v vozdukhe.) Hyg. Sanit. (Gigiena i Sanit.), 30(2):234-236, Feb. 1965. Translated from Russian.
CFSTI: TT 66-51033

The author designed and tested an instrument for the determination of the concentrations of nitrogen oxides and nitric acid fumes in air. The action of the instrument is based on measurements of the electrical conductivity of a solution obtained by drawing the air with nitrogen oxides through distilled water. The instrument is portable, its design is simple and it can be constructed under laboratory conditions. Its sensitivity is from 0.0003 to 20 mg nitrogen oxides per 1 liter of air. One analysis takes 1 to 2 min. Thirty ml of distilled water is introduced with the syringe into the upper tube and into the vessel. The water cannot leave the vessel because of the valve, and it forms a 1 cm layer between the two electrodes. now the pump is attached and 5 l of air are drawn in distilled water. Nitrogen oxide from the air combines with water to produce nitrous acid. The higher the concentration of nitrogen oxide in the air, the higher will be the concentration of the HNO2 solution in the vessel. Since HNO2, like HNO3, is a strong electrolyte and completely dissociated to ions in dilute solutions, the electrical conductivity of the solution is proportional to the concentration. The electrodes are fed with a constant voltage from a 4.5V source. In using the instrument, one must remember that interference is caused by gases that are readily soluble in water and produce a strong electrolyte on solution (the sulfuric acid fumes). After suitable graduation, the instrument can also be used for the determination of sulfuric acid fumes in air.##

C6911

G. E. Moore, A. F. W. Cole, M. Katz

THE CONCURRENT DETERMINATION OF SULFUR DIOXIDE AND NITROGEN DIOXIDE IN THE ATMOSPHERE. J. Air Pollution Control Assoc. (1), 25-8 (May 1967). (Presented at the 49th Annual Meeting, Air Pollution Control Association, Buffalo, N.Y., May 20-24, 1956.)

Concurrent determinations of SO2 by the conductimetric and colorimetric methods, and simultaneous determination of NO2 by the Saltzman colorimetric method were discussed. Conductimetric

determinations yielded consistently higher values for sulfur dioxide than the colorimetric method based on the chromogenic reaction of fuchsin, formaldehyde and sulfite. These differences may be accounted for, in part, by the presence of nitrogen dioxide in the atmosphere which reacts with the fuchsin reagent to lower the colorimetric sulfur dioxide value. The nitrogen dioxide concentration levels of the atmosphere fluctuate in a manner similar to those of sulfur dioxide and are somewhat lower in magnitude than the conductimetric sulfur dioxide levels. When the fuchsin values are corrected for the effect of nitrogen dioxide, the colorimetric sulfur dioxide levels are in fairly close agreement with those estimated by the conductimetric method.##

06919

F. Koroleff

DIRECT SPECTROPHOTOMETRIC DETERMINATION OF AMMONIA IN PRECIPITATION. Tellus (Uppsala) 18 (2), 562-5 (1966). (Presented at the CACR Symposium, Atmospheric Chemistry, Circulation and Aerosols, Visby, Sweden, Aug. 18-25, 1965.)

The method is based on the reaction of ammonium nitrogen with hypobromite in an alkaline medium. The excess of hypobromite is determined spectrophotometrically by adding an azo dye (Bordeaux B) solution, which is decolorized by hypobromite in acid solution. The influence of e.g. organic compounds is eliminated by allowing the whole reaction to proceed in acid solution also. The standard curve is a straight line up to 400 micrograms of ammonium nitrogen per liter, and the reaction is sensitive to 10 micrograms per liter, equal to 0.01 ppm, as determined in 25 ml of sample. (Author abstract)##

06955

M. N. Inscoe

PHOTOCHEMICAL CHANGES IN THIN LAYER CHROMATOGRAMS OF POLYCYCLIC, AROMATIC HYDROCARBONS. Anal. Chem. 36, 2505-6 (Dec. 1964).

The change in spot color due to photochemical changes of thin layer chromatograms in the identification of polycyclic aromatic hydrocarbons was discussed. The changes were observed on spots of 15 representative hydrocarbons following exposure to ultraviolet light. The absorbents used were silica gel G, aluminum oxide G, cellulose powder, and acetylated cellulose (21%). After the initial exposure to ultraviolet light, the changes take place even when the plates are kept in the dark. Similar, but slower, changes also occur on plates kept in ordinary roomlight, without exposure to other ultraviolet illumination. The changes are accelerated by continuous irradiation, either by long-wavelength ultraviolet light or by light of 253.7 millimicron. The nature of the developing solvent appears to have little effect on the colors observed. The presence of solvent often accelerates the changes in the spots. This effect is particularly noticeable with chlorinated solvents.##

06983

N. A. Poulos

AMPEROMETRIC PROPELLANT-COMPONENT DETECTOR. Olin Mathieson Chemical Corp., New Haven, Conn., Contract No. AF 33(600)-39311, Project No. 7165, Task No. 71386, ASD Technical Rept. No. 61-154, 39p., May 1961. 19 refs.
CFSTI/DDC: AD 265614

The data obtained in production of an improved multipurpose detector capable of measuring low airborne concentrations of nitrogen tetroxide (N_2O_4), ozone (O_3), hydrazine (N_2H_4), unsymmetrical dimethylhydrazine (UDMH), and hydrogen fluoride (HF) is presented. The concept of "forward and reverse polarization" was applied and considerable specificity was obtained of 100 microamperes per part per million of nitrogen tetroxide, 52 microamperes per part per million of ozone, 40 microamperes per part per million of hydrazine, and 20 microamperes per part per million of unsymmetrical dimethylhydrazine. (Author's abstract) ##

C6984

J. F. Boesler, C. R. McCully

DEVELOPMENT OF AN OZONE ANALYZER FOR USE IN AIRCRAFT. Armour Research Foundation, Chicago, Ill., Inst. of Tech., Contract No. AF 19(604)-3884, Rept. Nos. GRD-TR-60-282 and ARF 3128-12, 20p., June 1960.
DDC: AD 240873

An instrument is described which detects 0.100 ppm of ozone for use in aircraft at altitudes up to 80,000 ft. The resulting analyzer detects 0.1 ppm of ozone with an accuracy of 10%. It has sensitivity of 44 uv/ppm of ozone and a response time of 22-30 sec. The ARF ozone analyzer consists of two major parts: detector and amplifier. The detector, total volume 35 cu. in., consists of an aluminum chamber, through which an ozone-air mixture is passed, and a junction box for electrical connections and a synchronous motor. The chamber contains a rotor consisting of two thin-walled concentric cylinders, 1/2 and 3/4 in. in diameter and 1-15 in. long. The cylinders are bisected by a plane that attaches them to a concentric shaft, and one-half of each cylinder is coated with Hopcalite, a cayalyst which decomposes ozone. Fixed in the 1/8-in. annulus between the two cylinders and two matched thermistors. The rotor is turned by a 4-rpm motor. When the gas stream passes over the Hopcalite, the ozone is decomposed and there is a resultant temperature rise, which is detected by whichever thermistor the heated stream is then passing over. With the thermistors as elements in a simple four-arm d.c.-excited Wheatstone bridge, a 4-rpm signal results, which is coupled to a chopper-stabilized d.c. amplifier with a capacitance. The amplifier is employed to increase the signal so that it can be recorded. Field tests of the ozone analyzer demonstrated it s practicality and led to additional improvements

in sensitivity and stability. The instrument is sensitive to changes in humidity, but a dry ice trap was successfully employed to remove moisture without removing ozone. Changes in ambient temperature and flow rate have no effect on drift-resistant system. AAM##

C6987

L. H. Ruhnke

RELATIONSHIP BETWEEN CONDUCTIVITY AND NUCLEUS CONTENT OF THE AIR IN THE ARCTIC AND THE RESULTS OF SOME MEASUREMENTS. ((Army Signal Research and Development Lab., Fort Monmouth, N.J.)) (Jan. 1961). 17 pp. (USASRDL Technical Rept. No. 2176.)

In August 1959 measurements were carried out on the icecap in Greenland to determine the conductivity of air and the nuclei concentration of air coming from human settlements. A formula is shown which gives the relation between conductivity, density of large particles, and radius of the particles. With this formula and the measurements, an average radius of 2.7 x .000001 cm was obtained. The average total conductivity of the air was 5.0 x .0001/mho/m for air not contaminated by human activity. (Author's abstract)##

07097

L. H. Piette, J. H. Sharp, T. Kuwana, and J. N. Pitts, Jr.

PARAMAGNETIC RESONANCE OF SOME BENZOPHENONE DERIVATIVES IN THEIR PHOSPHORESCENT STATE. J. Chem. Phys., 36(11), 3094-5 (June 1, 1962).

Paramagnetic resonance absorption of the triplet or phosphorescent state in several para-substituted derivatives of benzophenone was observed. The phosphorescent states are formed during uv irradiation of the compounds in rigid solutions at liquid-nitrogen temperatures. Solutions of 4-aminobenzophenone, 4-dimethylaminobenzophenone, 4,4', bis-(dimethylamino) benzophenone, and 4-phenylbenzophenone were irradiated at 77 deg K. Paramagnetic resonance absorption was observed for all the above compounds at a magnetic field of about 1500 gauss, (g equals 4). In addition to paramagnetic resonance absorption at g equals 4, the irradiated solid solutions show strong phosphorescence. This phosphorescence decays exponentially with a mean lifetime of 0.41 plus or minus 0.04 sec and agrees favorably with the decay of the paramagnetic resonance absorption signal when the light is cut off. Mean phosphorescent lifetimes of the other compounds range from 0.2 to 0.4 sec and are being correlated with the decay of their EPR signals at g equals 4.##

07106

Thomas, M. D.

SULFUR DIOXIDE, SULFURIC ACID AEROSOL AND VISIBILITY IN LOS ANGELES. ((Intern. J. Air Water Pollution,)) 6:443-454, 1962. 16 refs. (Presented at the Air Pollut. Symp., Amer. Chem Soc., Sept. 1961 and at the Air Pollut. Contr. Ass. Meetings, May 1962.)

An automatic analyser for simultaneous recording of sulfur dioxide and sulfiric acid aerosol in air has been used to monitor the atmosphere in Los Angeles. Downtown, when the base of the inversion ceiling and wind speeds were low and oxidants were high (Rule 57 days) the oxidation of sulfur dioxide to sulfuric acid was maximal. Acid levels reached 5-20 per cent of the total sulfur with sulfur dioxide levels of 5-20 p.p.h.m. Percentage oxidation of sulfur dioxide decreased with increasing SO2 concentration above 5-10 p.p.h.m. In industrial El Segundo, the rate of oxidation of sulfur dioxide was about 60 per cent of the rate downtown under similar weather conditions. Presumably the accompanying smog concentrations were also lower in El Segundo. Visibility in areas immediately downwind from large consumers of fuel oil was reduced slightly on Rule 57 days, by burning oil containing 1 . 5 per cent sulfur instead of natural gas, but no effect was found at greater distances. Eye irritation downtown was independent of the amount of fuel oil burned. (Author"s abstract)##

07114

Fugas, M.

DETERMINATION OF NITROGEN DIOXIDE IN AIR. ((Odredivanje dusikovog dioksida u zraku.)) Text in Yugoslav. ((Arh. Hig. Rada Toksikol. (Yugoslavia),)) 13:207-229, 1962. 21 refs.

Three modifications of the Griess-Ilosvay reagent for the nitrite determination were investigated - the one according to the Manual of the ICI practice, the second after Saltzman, and the third after Jacobs and Hochheiser. Saltzman's reagent was found to be better than the ICI's concerning the colour intensity and the concentration range for which the reagent could be applied, and better than Jacobs' and Hochheiser's concerning the time of colour development and colour stability. Sunlight and elevated temperatures have unfavourable effects upon the reagents and their coloured products with NO2. The colour produced by Saltzman's reagent, as well as the reagent itself, were very stable at room and refrigerator temperatures. The ICI reagent has one advantage only: a more rapid colour development, so that it can be used for quick exposure assessment, on condition that the resulting concentration of NO2 is not higher than 0.5 mg per ml of solution. The colour produced in the reaction of NO2 with the ICI reagent was not stable for the concentrations higher than those mentioned above. The consistency of the results obtained with several absorbers of the same type was examined. Out of the

six types of absorbers only Pyrex and Sial absorbers with a fritted disk proved satisfactory. Trapping efficiency of Pyrex and Sial absorbers was about 85%, if the efficiency of evacuated bottles was taken as 100%. The overall efficiency of the method using Pyrex or Sial absorbers was practically 50%. Under the given conditions the method is accurate and reliable for a wide concentration range: from a few parts per billion to several thousand parts per million. (Author's summary, modified)**

07119

Louw, C. W. and E. C. Halliday

THE ACCURACY OF TOTAL OXIDANT MEASUREMENT AS OBTAINED BY THE PHENOLPHTHALIN METHOD. Intern. J. Air Water Pollution, 7:1033-1041, 1963. 7 refs.

The phenolphthalin method was chosen for a preliminary survey of total oxidant level in Pretoria air, because of its sensitivity. Difficulty was encountered in obtaining reliable standard curves. Some improvement was obtained when conducting all operations except photometer measurements at the temperature of melting ice. It was also found that when the sequence of adding the reagents was changed, so as to simulate conditions during actual sampling, a standard curve approximating a straight line was obtained. It follows that values of total oxidant obtained by any experimentor will depend to a certain extent upon the method of standard curve preparation he used, and when comparisons are made between measurements by experimentors in different towns or countries this factor should be taken into consideration. The accuracy (95 per cent confidence) obtained by the phenolphthalin method, using the mean of three successive samples, was shown to be in the region of 30 per cent for very low amounts of oxidant. (Authors' abstract, modified)**

07127

Holbrow, G. L.

ATMOSPHERIC POLLUTION: ITS MEASUREMENT AND SOME EFFECTS ON PAINT. J. Oil Colour Chemists, Assoc. (London), Vol. 45:701-718, Oct. 1962. 14 refs.

The various standard methods for the measurement of atmospheric pollution are described. Records of atmospheric sulphur dioxide and rainwater analysis collected from two paint exposure sites (suburban and industrial) indicate the nature and concentration of pollution that is likely to affect paint films. Specific effects of pollution on paint films are the attack on young films by sulphur dioxide, causing a delay in drying, production of water sensitivity and possible attack on certain pigments, formation of crystalline bloom; and staining. (Author's summary)**

07146

Gronsberg, E. Sh.

DETERMINATION OF VINYL CHLORIDE IN THE AIR. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:148-150, Jan. 1960. (Also published in Gigiena i Sanit., No. 11:43-44, 1954.) Translated from Russian.
CFSTI: TT 60-21049

The procedure described is based on bromination in chloroform solution with a bromine solution in a 1:1 mixture of glacial acetic acid and chloroform. The method is sensitive to 0.10 mg of vinyl chloride per test. The absorption of vinyl chloride from air is accomplished by aspirating the tested air through chloroform kept at -10 to -15 deg., at the rate of 10 - 12 liters per hour. This method is specific in the presence of methanol and dichlorethane. Observing the additional steps and precuations indicated obviates the interference of ethylene and of chlorine.##

07150

Dzedzichek, V. P. and A. V. Demidov

APPARATUS FOR THE DETERMINATION OF CARBON MONOXIDE AND CARBON DIOXIDE IN THE AIR AND OF GASEOUS COMPONENTS OF LIQUID FUEL. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:168-177, Jan. 1960. (Also published in Lab. Delo 3(4):46-51, 1957.) Translated from Russian.
CFSTI: TT 60-21049

The principle of the method described is the same as of the combustion methods currently in use. The carbon monoxide or the hydrocarbons contained in the air are oxidized to carbon dioxide in a combustion chamber with the aid of an electrically heated coil. The carbon dioxide is then passed through a coil condenser (absorber) which contains a known volume of a known solution of barium hydroxide, and the excess of the latter determined by titration with a standardized solution of HCl, and the results expressed in mg of CO or of hydrocarbons, as the case may be, per liter of air. The apparatus consists of four main sections: the purifying section, the distributor, the combustion chamber and the absorber. The apparatus and technic are described in detail.##

07180

W. Breuer

METROLOGY AND AIR POLLUTION. Die Messtechnik bei der Reinhaltung der Luft. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf) 107 (30), 1434-8 (Oct. 1965). Ger.

A survey of air pollution measurements is presented. In the group of emission measurements, a block diagram for continuous CO2 and SO2 measurements is given and some details of sampling and filtering are discussed. A nomograph relates the SO2 emission with the sulfur concentration of the fuel. These measurements operate on the principle of infrared absorption. Another block diagram shows examples of dust measurements. Both the electrostatically operating "Konitest" and a meter based on light extinction are employed. An electrochemical device determining chlorine is explained. Here the chlorine oxidizes iodide which in turn causes a depolarization current to flow. As an example of concentration measurements, an electrochemical device determining H2S in concentrations as low as 1 ppb is given. The electric current arising as the result of the formation of silver sulfide is of the order of 0.1 micron amp which can be amplified and recorded. A short discussion of practical aspects of sampling and statistical evaluations of results, in particular, relations to wind directions, concludes this paper.##

07364

Fukui, S.

DETERMINATION OF SULFUR OXIDES IN STACK GASES BY THE ARSENAZO III METHOD. Text in Japanese. Bunseki Kagaku (Japan Analyst (Tokyo), 14(9):838-842, 1965.

In determining sulfur oxides, arsenazo III is used as the indicator and a solution of barium and lead slat is used as the standard solution. The influence of isopropyl alcohol concentration and pH on arsenazo III was investigated and tabulated indicating that the proper amount of alcohol required is four times as great as the quantity of sample solution used; a pH of 3.0 is required for stable measurements. The influence of diverse ions of CL-, CO3-2, NO3-, and NO2- on this method is negligible for ion quantities of 10, 5, 5, and 2 mg, respectively, but 1 mg of PO4-3 interfers with measurement. The influence of SO3-2 on SO4-2 is negligible for quantities of SO3-2 300 times as great as SO4-2. Hydrogen peroxide does not interfere with the determination. Determination of sulfur oxides by the arsenazo III method, acid-base titration method, and Ba-chloranilate method show good agreement.##

07379

R. Kano

OZONE. Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc.) 2(1):54-59, 1964. 11 refs.

The methods of production, toxic nature, and methods of detection of ozone are described. The Denshi Ozonizer No. 1 is illustrated in which oxygen or air is passed between the dielectric plates and a silent discharge by high voltage a.c. produces ozone. The ozone concentration varies according to humidity and

temperature of the air, low temperature and humidity being favorable for effective utilization of the ozone. Part of the toxic character of ozone comes from the presence of nitrogen oxide as an impurity. The maximum allowable concentration of each in its pure state is 20 ppm but when mixed, 1 ppm is the maximum. Uses of ozone for air cleaning, oxidation of organic compounds, sterilization, water cleaning, deodorization, etc. are covered. Ozone detection methods are divided into chemical and physical methods. The physical method is more convenient and fast. Usually the odor of ozone permits its detection before much harm to the human body can occur.##

07391

H. Miyazaki, K. Ui, H. Ando

INVESTIGATION OF TEXT METHODS OF S-OXIDES AND N-OXIDES IN THE ATMOSPHERE. Text in Japanese. J. Japan Petrol. Inst. (Tokyo), 9(3):214-216, Mar. 1966. 10 refs.

The methods investigated are the electrical conductivity method, rosaniline method, and Saltzman method. Drawbacks to the electrical conductivity method are that SO2 and SO3 cannot be measured separately and that H2S, mercaptans, and other elements interfere with measurement. In addition, the electrical conductivity of the absorbing liquid depends on the temperature. The rosaniline method is used only for SO2. Considerations in using this method consist of the speed of absorption of the air tested, the shape of the absorber, absorption efficiency, and maintenance of the absorption liquid. Impingers and air washing bottles are also required. The absorption of test air depends on the celocity and on the shape of the bottle; absorption efficiency of the absorption liquid was good, indicating the need for only one absorption tube. Data obtained by sue of both electrical conductivity and rosaniline methods were in good agreement with each other. As for the Saltzman method for N-oxides, the absorption efficiency was found to depend on the speed of absorption and on the type of absorption tube used. It is difficult to make a perfect collection of NO2 by the Saltzman method. The hourly variation of NO2 concentration in Yokohama is graphed; it reached a peak of 0.05 ppm between 9 and 10 A.M. which is much less than the corresponding SO2 concentration.##

07401

Suzuki, S.

POTENTIAL AUTOMATIC DETECTOR OF SMALL AMOUNTS OF OXIDIZING GAS USING POTASSIUM IODIDE AS A REACTION INDICATOR (I). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 2(3):19-29, 1965. 7 refs.

The detector described consists of two parts: the measuring section and the recording part. The efficiency of the measuring

part was determined by a potentiometer which measured the relation between the iodine concentration and electric potential which are proportional. There was difficulty in obtaining good repeatability values; the problem is discussed in some detail. The efficiency of the automatic recording equipment was then tested. A wiring diagram of the apparatus is included. The relation between resistance change in the wire and deflection of the recorder is graphed. As for operating procedure, the effects of potential stability, bubbling, and ultraviolet rays were investigated. Graphs illustrate that initial potential stability in potassium iodide is difficult to reach but once obtained, the stability will remain constant during changes in potassium iodide. Other effects noted were that bubbling affects the voltage and the effect of ultraviolet rays is great. The detector was used for NO2, ozone, radioactive iodine, and other gases. The process and methods of examination are described in detail.##

07402

Suzuki, S.

POTENTIAL AUTOMATIC DETECTOR OF SMALL AMOUNTS OF OXIDIZING GAS USING POTASSIUM IODIDE AS A REACTION INDICATOR (2). STUDY OF FLUID IN THE CELL AND SALT BRIDGE COMPOSITION. Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 2(4):7-13, 1965. 4 refs.

In a previous discussion, the problem of irregularity of the reagent used in the cell of a potential automatic detector was covered. The structure of the cell and the composition are investigated in order to obtain a stable method for measuring small amounts of oxidizing gas. The equipment under investigation consists of cells of a reference electrode and an indicator electrode with a salt bridge between. The items examined are: (1) Effect of the reagent in the reference electrode cell; (2) Effect of pH of the solution in the indicating cell; (3) Effect of the salt bridge connecting the reference electrode and indicator electrode. Three types of salt bridge were examined, i.e., agar-agar and distilled water, agar-agar-potassium iodide and distilled water, and agar-agar-potassium iodide and buffer solution. Results showed that pH did not affect the potential of the solution in the reference electrode cell as long as iodide was added, but if iodide was not added, the solution was made acidic. The pH of the solution in the indicator electrode cell had no effect on the potential. The agar-agar-potassium iodide and buffer solution bridge was considered best.##

07427

G. E. Moore, R. S. Thomas, J. L. Monkman

THE ROUTINE DETERMINATION OF POLYCYCLIC HYDROCARBONS IN AIRBORNE POLLUTANTS. J. Chromatog., 26(2):456-464, 1968. 9 refs.

A method for the analysis of polycyclic hydrocarbons found in polluted air and tobacco tars is described in detail.

The chromatography of polycyclic hydrocarbons involves ccmpromises including the activity of the alumina, the depth of the adsorbent, and the amount of the ether, or other polar solvent used. Ultraviolet spectroscopy as a monitoring technique is not sufficiently sensitive. This lack of sensitivity may be the reason that column losses have been reported. Fluorescence as a monitoring technique is much more sensitive and must be used when benzo(a)pyrene is being measured, since the benzo(k)fluoranthene present in the venzo(a)pyrene fractions causes serious interference with measurements made at the characteristic benzo(a)pyrene peak at ca. 402nm.##

07435

A. Zdrojewski, A. L. DuBois, G. E. Moore, R. S. Thomas, J. L. Monkman

COLUMN CHROMATOGRAPHY AND SPECTROSCOPY IN THE ANALYSIS OF AIRBORNE POLYCYCLICS. J.Chromatog., 28(2):317-325. 1967. 16 refs

Analytical difficulties encountered during the separation (column chromatography) and measurement (spectrophotometric and fluorimetric) of polynuclear compounds are discussed. A glass tube 1.0 cm I.D. and 40.0 cm long is fitted with a teflon plug stopcock. The column is filled to a depth of 12 cm with a slurry of the deactivated alumina in cyclohexane. For ultraviolet absorption a Bausch & Lomb spectrophotometer and a Cary 14 recording spectrophotometer were used. For fluorimetric measurements a modified Aminco-Bowman spectrophotometer was used. The use of fluorescence is mandatory in the measurement of polycyclic hydrocarbons in air samples. Without its use, the analyst would be seriously handicapped with regard to sensitivity. There seems to be no evidence for losses on the chrcmatographic column and accordingly no need to correct for such losses. It is possible that apparent losses may be due to interference from the background. The background may be due to overloading of the column or to incomplete separation of a mixture of hydrocarbons having a common structure. These hydrocarbons are likely to be of the two to three ring type. Overloading of the column and incomplete separation are different affects, but the influence on the chrcmatogram will be the same.##

07441

I. R. Cohen, J. J. Bufalini

FURTHER OBSERVATIONS ON THE FERROUS AMMONIUM THIOCYANATE REAGENT FOR OZONE. Environ. Sci. Technol., 1(12):1014, Dec. 1967. 5 refs.

A reinvestigation of the ferrous ammonium thiocyanate colorimetric method for ozone has disclosed the following facts: This method for ozone has the advantage that a sample collected in the field need not be analyzed until it is returned to the

home laboratory. The time lapse may be several days or weeks. Unfortunately, the molar absorptivity, although constant for other oxidants such as n-butyl hydroperoxide, tertbutyl hydroperoxide, and hydrogen peroxide, is constant for ozone only at concentrations greater than 2 ppm (v/v). Unless the approximate ozone levels are known, the method is not useful if highly accurate ozone levels are desired. (Authors' summary)##

07482

Kanno, S.

DETERMINATION OF GASEOUS AIR POLLUTANTS. Text in Japanese. J. Jap. Petrol. Inst. (Tokyo), 7(2):92-96, Feb. 1964. 6 refs.

The determination of sulfur oxides and nitrogen oxides in smoke and in air are covered. SO2 in smoke is measured colorimetrically or by detection tube. Two methods are described: one for measuring pollutants after the combustion of coal or heavy oil or for gases mixed with NO2 and the other for mixtures of SO2 and SO3. Procedures are given for making the test liquid (absorption liquid) and for exact measurement for each method. The detection tube is illustrated briefly. The absorption tube method is not sufficient for NO2 detection. A method of almost perfect collecting efficiency which is used in the Kanagawa Prefecture Public Health Laboratories is described. The absorber is composed of a mixture of NaOH and butanol. For SO2 and SO3 measurement, the electric conductivity method and barium molybdate method are illustrated. The rosanaline method is used as well as an alkali filter paper method. The latter is superior to the widely used PbO2 method in that reagent quality does not affect the measured value and the collecting efficiency does not depend on temperature and humidity.##

07506

Ahlquist, Norman C. and Robert J. Charlson

A NEW INSTRUMENT FOR EVALUATING THE VISUAL QUALITY OF AIR. J. Air Pollution Control Assoc., 17(7):467-469, July 1967. 2 refs. (Presented at the Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Seattle, Wash., Nov. 3-4, 1966.)

The basic design features and operating characteristics of the integrating nephelometer are presented. The nephelometer was operated for a period from July 19 to Aug. 18, 1966 on the campus of the University of Washington. The intake was located in a southwest window about 40 ft above the ground. The preliminary data indicate that the instrument has high potential utility for measuring objectively a quantity closely related to the visual quality of air, the light scattering coefficient. Because the instrument is simple, stable, and relatively inexpensive, it appears desirable to investigate the possibility of including it in air monitoring networks when simultaneous information on the visual quality of air is desired.##

07540

C. O. Peterson, Jr., W. V. Dailey, W. G. Amrhein

APPLYING NON-DISPERSIVE INFRARED TO ANALYZE POLLUTED STACK GASES. Instr. Technol., 14(8):45-48, Aug. 1967. 3 refs.

The toxic and reactive properties that make some air pollutants difficult to analyze in the parts-per-million range are the properties that make it important to measure these effluents accurately. The operation of nondispersive infrared analyzers with a positive filtering type sensitization is reviewed. The method of sensitizing an instrument uses a negative filtering-type sensitization for nitrogen dioxide with a non-dispersive infrared analyzer. In the conventional method, nitrogen dioxide is used to sensitize the comparison cell and detector. However, it was found that it could not be used because of its reactivity. Propylene and vinyl chloride were satisfactory because they have strong adsorption bands at 6.2 microns. Acetone was used to equalize the infrared adsorption by water vapor in both cells. By negative filtering-type sensitization is was possible to desensitize water vapor response although the single-beam (positive filtering) response to water vapor was approximately four times that of nitrogen dioxide.##

07545

T. Sekigawa

MEASUREMENT METHOD FOR CONCENTRATION OF IONS IN POLLUTED AIR. Text in Japanese. Kuki Seijo (Clean Air, J. Japan Air Cleaning Assoc., Tokyo) 3(1):13-18, 1965.

The number of ions in air decreases when air is polluted so that the degree of air pollution can be determined by measuring the quantity of ions in the air at a given time. Generally, a cylindrically shaped ion counter is used which gives the number of ions. Corrections are made for the inverse electric field at the inlet of the counter, the existence of triple or other multiple charges, and from the change in the number of ions in air. Mathematical expressions for the corrections are given. Graphs for the relation between mobility and ion number before and after correction are compared.##

07648

Havir, J., A. Fidler, and R. Husak

THE DETECTION OF SULPHUR-COMPOUNDS WITH FLUORESCEIN-1,3,6,8-TETRAMERCURITETRAACETATE. Acta Chim. Acad. Sci. Hung., 50(1-4):39-42, 1966. 10 refs.

Grote's, and iodine-azide agents are usually used for the detection of thiocompounds on paper, or a thinlayer of aluminium oxide. For

the same purpose fluorescein-1,3,6,8 -tetramercuritetraacetate (further TMF) is also suitable. Weak acid, neutral and weak basic solutions of TMF show green-yellow fluorescence on paper or aluminium oxide. A suitable carrier used for chromatographic analysis is lightly covered by a spray of a basic solution of TMF. In such places, where a substance incorporating an SH group is present, fluorescence ceased and a dark red or violet spot appears in ultraviolet light; in case of higher concentrations of the substance the spot is visible even to the eye. This shows that TMF is suitable for chromatographic detection of thio-compounds. The sensitivity of TMF has been tested. In practical application in paper chromatography and subsequent detection with TMF reagent, thiourea, mercaptopyrimidines and some of their derivates were used. The RF values were established for these compounds using paper and thin layer chromatography. The papers deal with the chromatography of thiourea and its derivates. Spots caused by TMF were detected by means of UV light with filter. Results show that fluorescein-1,3,6,8-tetramercuritetraacetate (TMF) is the most sensitive agent for the detection of organic thiocompounds having an SH group.

07654

Urone, Paul

PROGRESS REPORT - TRACER STUDIES IN AIR POLLUTION: I. SULFUR DIOXIDE. Preprint, Colorado Univ., Boulder, Chemistry Dept., 12 p., ((1966)). 4 refs.

Radiochemical tracer techniques have been used to study air pollution problems associated with sulfur dioxide with respect to: (1) Efficiency and specificity of analytical methods, and (2) Reactions to sulfur dioxide in air. Sampling techniques using midget bubblers and tetrachloromercurate scrubbing solution (West - Gaeke method) were shown to become less efficient at air concentrations below 1 ppm. The conductometric method is efficient in capturing and measuring concentrations of sulfur dioxide in the parts per hundred million range. However, when ambient air is sampled, the conductometric method gives consistently high results. Efforts are being made to analyze the substances causing the high results. The reactions of sulfur dioxide have been studied in the main by use of static tests in which known concentrations of tagged sulfur dioxide were treated under various conditions of dark, sunlight, and ultraviolet irradiation and in the presence of water, nitrogen oxides, saturated and unsaturated hydrocarbons. The tracer techniques conbined with the various analytical methods described help give a considerable amount of information on the composition and mechanisms of substances in polluted air.

07655L

C86551
Abel, N. and C. Junge

DEVELOPMENT OF A LARGE-ION COUNTER OF HIGH SENSITIVITY. Text in German. Johannes-Gutenberg-Univ., Mainz, Germany, Meteorologisch-Geophysikalisches Inst., Nov. 1966. ((81))

refs. U. S. Army, European Research Office, Contract DA-91-591-EUC-3910, ((71)) p.
CFSTI/DDC: AD 813024L

A sensitive ion counter for the measurements of large-ion mobilities in atmospheric air has been constructed. It can be used to determine aerosol size distributions below .00005 cm radius in very clean tropospheric air masses with total aerosol concentrations as low as a few hundred per cc. The ion counter is of the integral type and was designed for maximum sensitivity. Particular attention was paid to the most suitable geometry, to the insulation problems and to stability of the driving voltage. A special device for eliminating displacement currents generated by voltage fluctuations was suggested and was under construction. Laboratory tests of the ion counter were made. The existing theories of equilibrium charge distribution on aerosol particles, which must be known to convert ion spectra into total aerosol spectra, are briefly discussed.##

07684

Regener, Victor H.

FURTHER APPLICATIONS OF THE CHEMILUMINESCENT METHOD FOR THE MEASUREMENT OF ATMOSPHERIC OZONE. New Mexico Univ., Albuquerque, Dept. of Physics and Astronomy, Contract AF 19(628)-2927, Proj. 8604, Task 860406, AFCRL-67-0029, 21p., Jan. 16, 1967.
CFSTI, DDC: AD 648916

Refinements and new applications of the chemiluminescent method for the measurement of atmospheric ozone are described. These include an improved balloon sonde with variable resistance output, a method for in-flight calibration of an aircraft ozone recorder, and a pilot installation for the measurement of ozone from a tower. The original chemiluminescent ozone sonde gives deviations from the calibration curve at the high end of the recorder chart when the battery voltages drop toward the end of a balloon flight. The new device needs only one calibration setting before the flight, namely that for "zero" ozone, because the high end of the chart scale corresponds automatically to zero resistance, or "infinite" ozone. Means for calibrating periodically the chemiluminescent material in ozone sensors was obtained by developing an in-flight source of ozone which would periodically add a known amount of ozone to the air intake of a balloon sonde. The ozone density produced in an air stream illuminated by ultraviolet light was utilized in this method.

07687

Young, Robert A.

MEASUREMENT OF NITRIC OXIDE IN THE EARTH'S ATMOSPHERE. Stanford Research Inst., Menlo Park, Calif., Contract No. DA-49-146-XZ-112, Project No. DASA-1887, SRI Project No. PAU-3895, 34p., March 23, 1967.
CFSTI, DDC: AD 649829

Recent fluorescent nitric oxide dayglow measurements have indicated that the concentration of NO is approximately 100 times larger than previously supposed. This result has necessitated a drastic revision of the models for NO production and loss and re - evaluation of the interaction of Lyman-alpha radiation from the sun with NO to create the ionization in the D-region. It is obviously extremely important to verify the fluorescent measurements by an entirely independent means. Status is described of a nitric oxide detector that is being developed for use in the lower ionosphere. The sensor, which operates by selective photoionization of nitric oxide, was essentially completed. The associated electronics were designed. The mechanical components were designed and partially completed.

07709

Vernot, E. H., J. D. MacEwen, D. L. Geiger, and C. C. Haun

THE AIR OXIDATION OF MONOMETHYL HYDRAZINE. Am. Ind. Hyg. Assoc. J., 28(4):343-347, July- Aug. 1967. 10 refs.

The air oxidation of monomethyl hydrazine was examined using gas chromatography and infrared spectrophotometry. Major products were found to be molecular nitrogen and methane. First order kinetics were obeyed and half-life calculated to be 34 minutes under the conditions used. Evidence that the reaction was surface catalyzed was provided by the much facter rate shown when a polyethylene container was substituted for glass. (Authors' summary)

C7749

Ives, N. F. and Laura Giuffrida

INVESTIGATION OF THERMIONIC DETECTOR RESPONSE FOR THE GAS CHROMATOGRAPHY OF P, N, As,AND Cl ORGANIC COMPOUNDS. J. Assoc. Offic. Anal. Chemists, 50(1):1-4, Feb. 1967. 8 refs. (Presented at the 8th Annual Meeting, Association of Official Analytical Chemists, Washington, D.C., Oct. 10-13, 1966.)

Investigations were conducted to determine the degree of specificity and enhanced response of the thermionic detector (TD), using alkali metal salts.The test compounds included the triphenyl derivatives of group V (a) elements. Because of special interest in nitrogen response, several types of nitrogen compounds were included. The effects of varying jet diameter, carrier gas, and other operating parameters were also studied. Thermionic response to grooup V(a) elements in organic compounds was found to depend on the salt cation used in the TD. The magnitude of response was similar for different salts of the same cation. Increased response for phosphorus was 10,000 fold or better, for nitrogen about 100 fold, and for arsenic about 30 fold. With an unknown response, phosphorus can be distinguished from nitrogen or arsenic by comparing the thermionic and conventional flame responses.The detection of nitrogen in organic compounds was not affected adversely by us-

ing nitrogen as a carrier gas. With certain size flame jets, a significant increase in thermionic response can be obtained by substituting helium for nitrogen as the carrier gas. Detector stability was best with potassium salts and was better with rubidium than with cesium salts; KCl was preferred for phosphorus compounds and RbCl for nitrogen compounds.

07807

Altshuller, A. P.

APPLICATION OF REACTIVITY CONCEPTS TO EMISSIONS FROM DEVICE EQUIPPED AND UNEQUIPPED AUTOMOBILES. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((18))p., ((1967)). 12 refs.

Various manifestations of atmospheric photochemical reactions can be associated with the relative ability of various hydrocarbons to participate in these reactions. The ratings derived from such manifestations have been used to develop a number of hydrocarbon reactivity scales. These scales are utilized in evaluating the effectiveness of automotive exhaust control devices. The effectiveness of the devices as computed from reactivity scales is compared with total hydrocarbon measurements.

07814

Boiteau, H. L., and Cl. Moussion

A SIMPLE APPARATUS FOR THE DETERMINATION OF CERTAIN GASEOUS OR VOLATILE TOXIC SUBSTANCES. ((Un appareil simple pur le dosage de quelques toxiques gazeux cu volatils.)) Text in French. Ann. Biol. Clin. (Paris), 25(1-2):215-227, Jan.-Feb. 1967. 4 refs.

A simple apparatus made of pyrex glass for the estimation of a number of gases in air or in mixtures is described with particular reference to toxic substances such as carbon dioxide, carbon monoxide, nitrogen peroxide, hydrogen cyanide, and trichlorethylene. The device consists of two glass cylinders, one 100 ml in capacity which acts as a reaction chamber and is connected by a stopcock to another 10 ml chamber which is sealed with a glass stopper. The reaction chamber has another stopcock at the opposite end of the cylinder from the connecting stopcock. The stopper on the smaller chamber is removed and the stopcocks are opened while 400 to 500 ml of the sample is drawn slowly through the apparatus. The stopcocks are then closed and the smaller chamber is then flushed out with nitrogen or unpolluted air. The appropriate reagent is added to the small chamber and the chamber is closed by the ground glass stopper. The connecting stopcock is opened and the gas can then react with the reagent which varies with the subject gas as does the method of analysis of the absorbed gas. The determinations can be made rapidly with few manipulations and are accurate and sensitive enough for the requirements of a toxicological analysis.##

C7830

Popov, V. A.

THE PRESENCE OF OXIDANTS IN THE ATMOSPHERE OF CERTAIN TOWNS IN THE U.S.S.R. ((Prisultstvie oksidantov v atmosfernom vozdukhe nekotorykh gorodov SSSR.)) Text in Russian. Engl. transl. Hyg. Sanit., 31(1-3): 3-8, Jan.-March 1966.

Oxidants in the air of certain towns of the Soviet Union were measured by the phenolphthalein method. The standard color scale was a mixture of an alcoholic-aqueous solution (3:2) of phenolphthalein and 1% borax solution. The maximum concentration of oxidants on the highways of Moscow and Baku on sunny days was as high as 0.1 mg/cu m, and on cloudy days did not exceed 0.03 mg/cu m. A study of this type of pollutants in Baku revealed their presence in the area of oil refineries at concentrations within 0.15 mg/cu m. On the other hand, the maximum value of oxidants in the vicinity of Batumi oil refinery was considerably lower (0.04 mg/cu m).##

C7838

Dimitriades, Basil

METHODOLOGY IN AIR POLLUTION STUDIES USING IRRADIATION CHAMBERS. J. Air Pollution Control Assoc., 17(7):460-466, July 1967. 12 refs.

Experimentation in large irradiation chambers has been useful in providing insight into the chemistry of the photochemical smog formation problem. Initial efforts to reproduce the atmoshperic phenomena artifically at controllable scale were successful in that gross atmospheric smog symptoms were observed in irradiation chambers. However, as the experimentation and evidence produced were becoming more elaborate, the question arose as to how much one could rely on chemical data in understanding and interpreting atmospheric phenomena. The question becomes highly pertinent in view of the difference in concentration levels between atmosphere and chamber work. This issue was discussed during recent American Chemical Society meetings, and the conclusions from presnetations and discussions were as follows: (1) There is qualitative agreement between chamber data and atmospheric data wherever comparison is feasible. (2) There is need for more precise chamber work at concentration levels more nearly equal to those in the atmosphere. Experimentation in chambers under typical atmospheric conditions presents some special problems associated with the chamber design and chemical analysis. Chamber methodology has been the focus of considerable research effort, and it appears to be an important factor affecting further progress in air pollution research. This paper describes methods and techniques used at the Bartlesville Petroleum Research Center. (Author's abstract)

07857

F. H. Davis

A REVIEW OF PHYSICOCHEMICAL METHODS FOR NITROGEN, OXYGEN, AND NITRIC OXIDE MEASUREMENTS. Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio, Research and Technology Div.,
CFSTI/DDC: AD 648039
Project No. 1426, Task No. 142610, Tech. Rept. AFFDL-TR-66-71, 43p., Aug. 1966. 164 refs.
CFSTI/DDC: AFFDL-TR-648039

Several of the physicochemical methods used within approximately the last 15 years for research studies performed with molecular nitrogen, atomic nitrogen, molecular oxygen, atomic oxygen and nitric oxide are summarized. Several of the techniques used are: modified conventional spectroscopic techniques, emission and absorption; electron-beam probe studies; flash photolysis (NO_2, O_3, Cl-oxide decomposition, formation of vibrationally excited O_2); shock tube studies (dissociation of O_2, indirect measurement of recombination rates at high temperature); flame reaction studies (approach to thermal equilibrum of flame gases measured by photometric or mass-spectrometric methods); modified Wood-Bonhoeffer experiments (fast-flow studies utilizing the air after-glow, catalytic probes, or Wrede-Harteck gauges to measure O-atom concentration); photolysis techniques (Hg-sensitized photolysis of nitrous oxide, low concentration photolysis of nitrogen dioxide); and mass-spectrometer studies (fast reactions by time-of-flight mass spectrometry studies of discharged oxygen by modified, conventional mass spectrometry). The use of an electron-beam probe is extensively discussed since this technique has been directly applied to rarefied, nonradiating, nitrogen-containing gas flows. Some of the techniques used in the past for measurement of gas temperatures are outlined.##

07867

Gudiksen, P. H. P. W. Hildebrandt, and J. J. Kelley, Jr.

COMPARISON OF AN ELECTROCHEMICAL AND A COLORIMETRIC DETERMINATION OF OZONE. J. Geophys. Res., 71(22):5221-5223, Nov. 15, 1966. 6 refs.
CFSTI/DDC: AD 645729

The data from six Brewer-Mast electrochemical ozone analyzers were compared with an arbitrarily chosen analyzer of identical manufacture to determine aging of the sensor cells during prolonged field use. An independent colorimetric method for the determination of ozone was used to standardize the reference analyzer. Athough the individual electrochemical analyzers give reproducible readings, they differ from each other by as much as 20 percent and from the colorimetric results by as much as 60 percent. These differences are primarily due to aging.The effects of aging can be reduced significantly by thorough periodic cleaning of the sensor cell. (Authors' abstract)

07885

R. J. Lewis, R. Smith, P. Baker

AN ANALYSIS OF INSTRUMENT DOWNTIME FOR A LARGE AIR MONITORING NETWORK. Preprint. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, (12)p., 1967. (Presented at the 60th Annual Meeting, Air Pollution Control Association., Cleveland, Ohio, June 12-16, 1967.)

There is a prevalence of opinion encouraged by company sales representatives that currently available continous air monitoring equipment is truly continuous and automatic. The word automatic as applied to present air monitoring instruments is defined by a detailed analysis of the type of instrument failures which can be expected. The experience is drawn from the operating reports and records of the Continuous Air Monitoring Project (CAMP). Failure of the instrument system can come about for many reasons, and is defined by the loss of anticipated valid data output. Three major causes for loss of data are instrument failure, personnel failure, and supply support failure. It is concluded that successful network operation of continuous air monitoring equipment demands careful design of support functions and personnel selection. A continual reanalysis of operating efficiency and upgrading of personnel training is mandatory. (Authors' abstract, modified)##

07889

J. S. Nader

PROBLEMS AND DEVELOPMENTS IN MONITORING AIR POLLUTION SOURCES. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 16p., 1967. 25 refs. (Presented at a symposium on Air Pollution Instrumentation sponsored by the Connecticut Valley Section of the Instrument Society of America, Hartford, Conn., Feb. 23, 1967.)

Automatic and continuous monitoring of air pollution sources is discussed relative to needs in air pollution control and in terms of in-stack and remote measurement techniques. Commercially available equipment and application problems are reviewed for both gas and particulate measurements. The appliaction of advanced methods developed in other technologies to air pollution source monitoring is discussed; these include such techniques as passive IR spectroscopy, lidar probing, and Raman spectroscopy. (Author's abstract)##

07913

Waters, Richard H. and Richard F. Reynolds

FINAL REPORT - ANALYSIS AND MODIFICATION OF RVR EQUIPMENT FOR RVR VALUES 500 FEET AND ABOVE. Environmental Science Services Administration, Silver Spring, Md., Equipment

Development Lab., Contract FA-65 WAI-96, Project 450-402-01E, RD-66-9, ((154))p., May 1966. 4 refs.
CFSTI,DDC: AD 651551

A rationale of the design criteria and choices of the present Runway Visual Range (RVR) system, reportings based on atmospheric transmittance measured over a 500 foot path, is presented. Modifications to existing equipment for low RVR reporting on three different schedules are described. Each of the three reporting modes are based on transmittance measurements over a 250 foot path. Reportings are from 600 feet in 200 and 500 foot increments, from 500 feet in 100 and 200 foot increments and from 500 feet in 100, 200 and 500 foot increments. Cost reductions that could be effected in the purchase of new equipment as a result of eliminating one or two light settings are revealed. RVR computer modifications are discussed for an end-to-end transmissometer configuration. An operational analysis of the RVR computer system reveals three areas requiring improvement: additional circuitry is required to provide more reliable operation of the Receiver-Decoder over noisy signal lines; a design change is needed to eliminate the possibility of serious damage to the computer by erroneous insertion of interconnecting cables, and improved fabrication methods should be applied to the etched circuit relay board of the Signal Data Converter. Various modes of system operation enhancement are discussed: oral RVR reporting, data communication methods, and RVR testing capability expansion.##

07938

M. L. Kain, B. T. Commins, G. Dixon-Lewis, J. F. Nunn

DETECTION AND DETERMINATION OF HIGHER OXIDES OF NITROGEN. Brit. J. Anaesthesia (Altrinham), Vol. 39, 425-431, 1967. 17 refs.

Methods are described for the determination of NO, NO2 or (2O4 as contaminants of nitrous oxide. Most of the discussion is related to nitrous oxide as an anesthetic, however, the most sensitive methods which will detect less than 1 ppm are appropriate for studies of air pollution. Saltzman developed a colorimetric method which uses the diazo reaction to determine NO2. It has been adapted for the measurement of NO. Nitrous acid is formed when NO2 dissolves, diazotizing sulphanilic acid which then couples with alphanaphtyl ethylene diamine to give a magenta color. The calibration is made by adding known amounts of sodium nitrite solution. Assuming that 1 mole of NO2 gives the same color as 0.72 moles of sodium nitrite, the concentration of NO2 can be determined if the volume of the test gas is known. Although there is some doubt about calibration, this test is the most reliable and sensitive one available at present. Concentrations of less than 1 ppm can be detected.##

C7981

Green, A. E. S., D. T. Williams, R. S. Sholtes, and J. Dowling, Jr.

THE MIDDLE ULTRAVIOLET AND AIR POLLUTION. In: A. E. S. Green, ed., The Middle Ultraviolet: Its Science and Technology, New York, John Wiley & Sons, 1966, Chapt. 8, p. 158-164. 32 refs.

Currently in the air pollution field a great effort is underway to find and develop more specific methods of measuring contaminants. It appears that ultraviolet spectroscopy would be an important tool in measuring these trace species. The important pollutants such as nitrogen dioxide, sulfur dioxide, and ozone all have strong absorption coefficients in the ultraviolet, as do many of the other lesser pollutants and the products of the photochemical reactions which play such a large role in smog formation. Both chemical and spectroscopic methods have their advantages and disadvantages. Perhaps the greatest importance in utilizing ultraviolet spectroscopy is that a program which complements the chemical program could be obtained. The two programs working together should indeed contribute significantly to the body of knowledge which is necessary to solve the air pollution problem.

08049

Dave, J. V. and Carlton L. Mateer

A PRELIMINARY STUDY ON THE POSSIBILITY OF ESTIMATING TOTAL ATMOSPHERIC OZONE FROM SATELLITE MEASUREMENTS. J. Atmospheric Sci., 24(4):414-427, July 1967. 16 refs.

A preliminary study of the feasibility of determining total atmospheric ozone from satellite measurements of the solar ultraviolet radiation diffusely reflected by the earth|s atmosphere is presented. The atmospheric model used is plane-stratified, and the evaluation of the radiation field takes into account all orders of rayleigh scattering. In addition, the model provides for variations in the total amount and vertical distribution of ozone, as well as the Lambert reflectivity and pressure at the effective base of the atmosphere. The results indicate that the wavelength region in which measurements should be made lies between about 3125 and 3175 A, if the observations are restricted to the nadir direction. Wavelengths shorter than 3125 A do not penetrate adequately through the ozone layer and do not, therefore, contain information on total ozone content. Wavelengths much longer than 3175 A offer rather poor sensitivity to total ozone. The accuracy of total ozone determinations, based on measurements at a single wavelength, is not likely to be better than 10 percent even if the intensity ratio (diffusely reflected to extraterrestrial input flux) is measured within 1 percent, reflectivity within 0.05, and cloud-top or surface pressure within 50 mb. More accurate determinations of surface reflectivity are essential for improving the accuracy of the total ozone determination. Measurements on a pair of wavelengths, one within the 3125-3175 A range and the second at 3300 A, are found to reduce the effects of reflectivity.

Over a moderate range of solar zenith angle, measurements on the wavelength pair (3175, 3300 A) will permit deduction of total ozone within 5 percent, provided the various quantities are determined with the above-noted accuracies. When the zenith angle of the sun exceeds about 60 deg., penetration of the ozone layer is incomplete and a simultaneous determination of the high level ozone distribution from measurements at still shorter wavelengths is necessary for optimum accuracy of the total ozone determination. AAM

08073

Gee, Sherman

METHOD FOR LASER MEASUREMENT OF PARTICLE CONCENTRATION IN GASES. Arnold Engineering Development Center, Arnold Air Force Station, Tenn., AEDC-67-44, 10p., Feb. 1967. 8 Refs.
DDC: AD 808304

A method is outlined for employing laser scattering and extinction measurements to establish the molecular and particle content of a gas. The effect of particle size distributions is included. The method involves simply measuring the intensity of the laser light scattered from and transmitted through the gas. Molecular and average particle density can then be deduced from these measurements. Knowledge of the actual particle size distribution in the gas is shown to be unnecessary if the average particle size is known and if a specific scattering angle is employed. (Author's abstract)

08077

Johnson, F. A.

DETECTION OF LOW LEVELS OF TETRAFLUOROHYDRAZINE IN AIR. Rohm and Haas Co., Huntsville, Ala., Redstone Research Labs., Contract DAAHOI-67-C-0655, S-137, 19p., June 1967.
DDC: AD 815940

Tetrafluorohydrazine was converted to fluoride ion by nitrogen dioxide and water. The fluoride ion was detected continuously by a commercial fluoride ion electrode. A 30-mV change in electrode potential was obtained for one part per million of N_2F_4 in the air. Various factors affecting sensitivity, stability, and speed of the detection system were considered. (Author's abstract)

08133

L. S. Chesodanova

THE DETERMINATION OF SMALL QUANTITIES OF PHTHALIC ANHYDRIDE IN THE AIR OF INDUSTRIAL PREMISES. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst.

for Applied Tech., Vol. 3, p. 16-18, May 1960.
CFSTI: TT 60-21475

Phthalic anhydride in the air of industrial premises was determined colcrimetrically. The method is based on the conversion ofphthalic anhydride to fluoreseein. The reaqents used are outlined. Absorption of phthalic anhydride from the air was tested with absorbent cotton, glass "wool", filter paper, and porous glass discs. Best results were obtained with ash-free filter paper.##

08135

V. A. Shchirskaya

THE DETERMINATION CF OZONE IN THE PRESENCE OF NITROGEN DIOXIDE AND HYDROGEN PEROXIDE. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated frcm Russian by B.S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 20-23, May 1960.
CFSTI: TT 60-21475

In search of a new method for the determination of ozone the following were investigated: chronic anhydride as an absorbent for the fumes of hydrogen peroxide and silicagel saturated with a 0.02 M solution of potassium dichromate in concentrated sulfuric acid as an absorbent for nitrogen dioxide. In the determination of ozone in the presence of H2O2 chromic anhydride can be used as an absorbent for the hydrogen peroxide vapor in 0.005-1.1 mg/1 concentrations. Finely granulated silicagel saturated with a 0.02 M solution of potassium dichromate in concentrated sulfuric acid retained nitrogen dioxide present in the air in 0.001 - 0.02 mg/1 concentrations. It can be used in the determination of ozone in the air in the presence of nitrogen dioxide.##

08136

Senderkhina, D. F.

DETERMINATION OF CHLORINATED HYDROCARBONS IN THE AIR BY THE METHOD OF MICRO-COMBUSTION. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 23-27, May 1960.
CFSTI: TT 60-21485

The method described is based on the quantitative oxidation of chlcrinated hydrocarbon vapor in a combustion chamber equipped with a platinum coil heated to redness. The combustion products are then passed through an absorber solution and the ionic chlorine determined nephelcmetrically. With an appropriately prepared standard scale accurate determinations

can be made in solutions containing 0.001 mg of chlorine in 1 ml. Control tests were made with ethylene chloride, chloroform, carbon tetrachloride and trichlorethylene. A portable apparatus for the determination of chlorinated hydrocarbons in the air by the micro-combustion method was constructed. The micro-combustion method described proved to be accurate for the determination of thousandths of a milligram of chlorine within 30 to 40 minutes. A new micro-absorber is described which assures complete absorption of products of hydrocarbon combustion. Air samples are aspirated into gas pipettes filled with a saturated solution of sodium sulfate or into vacuum gas pipettes.##

08256

Buck, Manfred and Heinrich Stratmann

THE JOINT AND SEPARATE DETERMINATION OF NITROGEN MONOXIDE AND NITROGEN DIOXIDE IN THE ATMOSPHERE. Staub (English translation), 27(6):11-15, June 1967. 10 refs.
CFSTI: TT 67-51408/6 (HC $2.00)

In the use of the Saltzman reagent for the determination of nitrogen dioxide in the atmosphere, 1 mol NO2 is equivalent to 1 mol NO2 from sodium nitrate. It has been shown that this ratio factor depends on NO2 concentration; for 6 g NO2/N cu m it is about 0.62 and with increasing NO2 concentration it approximates the value of 1. Operating conditions are proposed for combined and separate determination of NO and NO2, under which no NO2 losses occur as a result of absorption of the required NO oxidation.

08284

G. Kuers

DETERMINATION OF VERTICAL DISTRIBUTION OF THE DUST EXTINCTION COEFFICIENT BY LIGHT-SCATTERING MEASUREMENTS UP TO 2,440 M. ALTITUDE. ((Bestimmung der vertikalen Verteilung des Dunst-Streukoeffizienten aus Streulichtmessungen bis in 2,440 M. Hohe.)) Text in German. Deutsche Versuchsanstalt fuer Luft- und Raumfahrt, Munich, Germany, DLR-FB-66-54, 51p., Aug. 1966. 43 refs.
DDC: AD 803817

Measurements of spectral radiance of the sky are reported up to an altitude of 2,440 meters. A helicopter, equipped with a self-orienting radiation measuring device which self-aligns its direction of view relative to the sun's direction, was used. The measuring device is described and illustrated. Results have been used to compute the vertical distribution of the dust extinction coefficient. Data from the southwestern region of Munich yielded a reinforced decrease in the dust extinction coefficient at an altitude of 1,500 meters; this effect is explained by a temperature inversion at this level which has been proven by radiosonde. The influences of water vapor absorption at the ends of the absorption band and of aerosol absorption upon measurement results are discussed.##

08294

Boettner, E. A. and Benjamin Weiss

AN ANALYTICAL SYSTEM FOR IDENTIFYING THE VOLATILE PYROLYSIS PRODUCTS OF PLASTICS.
Am. Ind. Hyg. Assoc. J., p. 535-540, Nov.-Dec. 1967. 1 ref.
(Presented at the American Industrial Hygiene Association Meeting, Houston, Texas, 1965.)

Techniques are described for determining the identity and toxicity of the pyrolysis products of plastics. Differential thermal analysis (DTA) and thermogravimetric analysis (TGA) determine the temperature at which the plastic melts, the temperature at which it goes through physical and/or chemical change (oxidation or reduction), and the temperature at which it undergoes weight losses. The identity and quantity of the combustion products are determined with a controlled combustion furnace, utilizing the temperature information obtained by DTA and TGA. The combustion products emitted by the furnace are separated by gas chromatographic techniques and analyzed by infrared absorption, ultraviolet absorption, other gas chromatographic techniques, and mass sectroscopy. The results obtained utilizing polyvinyl chloride are described. (Authors' abstract)

08296

Valori, P. C. Melchiorri, A. Grella, and G. Alimenti

VOLATIZATION AND DECOMPOSITION OF AROMATIC POLYCYCLIC HYDROCARBONS DURING THE USUAL PROCEDURE FOR THE CONCENTRATIONS OF EXTRACTS OF ATMOSPHERIC DUST. ((Sulla volatilizzazione e la decomposizione degli idrocarburi policiclici aromatici nel corso degli abituali procedimenti per la concentrazione degli estratti di pulviscolo atmosferico.)) Text in Italian. Nuovi Ann. Igine Microbiol. (Rome), 17(4):311-324, 1966. 37 refs.

Research is described on a series of commercially available hydrocarbons which are found in polluted air (naphthalene, acenaphthalene, fluorene, phenanthrene, anthracene, 9,10-dihydroanthracene, pyrene, fluoranthene, chrysene, 1,2-benzanthracene, naphthacene, perylene, 3,4-benzopyrene, 1,12-benzoperylene, anthanthrene, 1,2,5,6-benzanthracene, and coronene). The sample hydrocarbons were evaporated at medium heat (hot water bath at 90-95 deg Co.), or dried with a jet of filtered air, or with a jet of nitrogen; samples were either evaporated to dryness or to a liquid volume of 2 ml. The per cent loss for all three techniques is tabulated. The highest proportion of sample loss (up to 100 percent) is generally encountered when dry heat is used to evaporate to dryness. The per cent loss varies with the individual hydrocarbon, and is generally correlated with volatility. Other modes of sample loss are discussed: decomposition, reaction with other chemicals, oxidation, and ultraviolet photodecomposition. The data are discussed with reference to experimentation with air-borne carcinogens. These data were to be used in the development of a procedure for the analysis of polluted air.

08311

Kelley, John J., Jr.

ATMOSPHERIC OZONE INVESTIGATIONS AT BARROW, ALASKA, DURING 1965. Washington Univ., Seattle, Dept. of Atmospheric Sciences, Contract 477(24), Proj. NR-307-252, 96p., June 1967. 8 refs.
CFSTI, DDC: AD 653745

The results of the measurements of ozone in air at Barrow, Alaska, are presented. The theory of operation of the microcoulomb analyzer, and the methods of calculations and calibrations are discussed. The average daily and hourly concentrations of ozone in the atmosphere near the ground surface are tabulated for the year 1965. The results of the analysis of ozone measured continuously from light aircraft along several transects in northern Alaska are given. (Author's abstract)##

08323

Pellet, E. M., W. E. Westlake, and F. A. Gunther

A METHOD FOR OBTAINING THE EMISSION SPECTRA OF ORGANIC COMPOUNDS UTILIZING THE MICROWAVE EMISSION DETECTOR FOR THE GAS CHROMATOGRAPH. Bull. Environ. Contamination Toxicol., 2(5):255-263, 1967. 4 refs.

A continuous flow system for the gas chromatographic component of an apparatus which permits the scanning of the emission spectrum of any diatomic or polyatomic organic compound of sufficient vapor tension, is described with diagrams and photographs. The apparatus consists of a microwave emission detector coupled to a gas chromatograph with a continuous flow component. The spectra obtained for triethyl and triphenyl phosphite and Guthion are given. Various precautions to be taken in the determinations such as cleaning, vapor tension of the samples, and flow of the sample are discussed. By completely enclosing the optical system it is possible to scan the visible range well into the infrared without appreciable baseline drift, permitting many further applications of the instrument.##

C8340

Thomas, Jess W. and David Rimberg

A SIMPLE METHOD FOR MEASURING THE AVERAGE CHARGE ON A MONODISPERSE AEROSOL. Staub (English translation), 27(8):18-22, Aug. 1967. 11 refs.
CFSTI: TT 67-51408/8 (HC $2.00)

A simple parallel plate electrostatic precipitator was used to determine the average charge of a monodisperse aerosol. The fractional collection efficiency of the precipitator was

measured as a function of plate voltage and data extrapolated to zero voltage. The extrapolation gave the average charge per particle of the monodisperse aerosol. The method was confirmed by use of the classical Millikan technique for determination of charge on individual particles. The average charge of aerosols in charge equilibrium with air ions was also determined for comparison with values calculated from the Boltzmann equation. It was found that the average charge per particle was somewhat greater than that predicted by the Boltzmann equation. (Authors' summary, modified)##

08354

Brink, D. L., and J. P. Thomas, and D. L. Feuerstein

MALODOROUS PRODUCTS FROM THE COMBUSTION OF KRAFT BLACK LIQUOR. II. ANALYTICAL ASPECTS. TAPPI, 50(6):276-285, June 1967. 25 refs. (Presented at the 51st Annual Meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y., Feb. 21-24, 1966.)

Gaseous and liquid products isolated by pyrolysis of kraft black liquor, were analyzed qualitatively and quantitatively using gas-liquid chromatography with detection by flame ionization. More than 60 compounds were detected in the pyrolysis liquid and at least 32 of these were present in the pyrolysis gas. Using the microcoulometric titration system, hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, and at least 19 unidentified sulfur-containing components were detected in the pyrolysis products; 7 of the major components were determined quantitatively. Using cochromatography and the methods of detection noted, the identities of methyl mercaptan, dimethyl sulfide, and dimethyl disulfide were verified and tentative identifications of several other sulfur-containing products were also made. Hydrogen, oxygen, nitrogen, methane, carbon monoxide, ethane, carbon dioxide, and acetylene were resolved and determined quantitatively. Hydrogen sulfide, methyl mercaptan, and five unidentified components were also qualitatively detected. Sulfur present in pyrolysis residues was determined using a wet oxidation procedure. A powerful analytical method has been developed for detailed study of the effects of recovery furnace operation on such emissions and it should prove to be a valuable aid to industry. With adequate development, pyrolysis carried out independently of gaseous, liquid, and solid products could provide an answer to complete odor control; in addition, isolation of organic by-products may be feasible. AAM##

08357

Cave, G. C. B.

THE COLLECTION AND ANALYSIS OF ODOROUS GASES FROM KRAFT PULP MILLS. PART III: THE ANALYSIS OF COLLECTED POLLUTANTS BY GAS CHROMATOGRAPHY. TAPPI, 46(1):11-14, Jan. 1963. 4 refs.

The qualitative and quantitative analysis of kraft-mill pollutants in ethylbenzene by using gas chromatography is

discussed. Columns of tri-m-cresyl phosphate and of Carbowax 1540 are proposed for use at 35 and 85 C. These columns permit the resolution of all known kraft-mill pollutants. Techniques are described for qualitative analysis. They include the two-column method, and graphs prepared by this method are presented for homologous series of mercaptans, ketones, esters, and normal alcohols. It is emphasized that the unequivocal identification of an unknown pollutant is rarely possible by gas chromatography alone. Quantitative analysis is also described, including the preparation of standard solutions and the presentation of prepared calibration curves. These curves were straight lines. The use of an ultrasensitive detector, the ionization chamber, is briefly discussed. (Author's abstract) ##

C8369

Fiocco, Giorgio

APPLICATION OF LASER RADARS TO THE STUDY OF THE ATMOSPHERE. In: Gene G. Manella (ed.), Aerospace Measurement Techniques, National Aeronautics and Space Administration, Washington, D. C., Scientific and Technical Information Div., 1967, p. 123-131. 5 refs. (Presented at the Symposium on Aerospace Measurement Techniques, Cambridge, Mass., July 7-8, 1966.) NASA: SP-132, GPO: 0-240-412 (HC $1.00)

Lasers can be suitably utilized in the development of optical atmospheric probes capable of measuring some of the atmospheric parameters at a distance. During the past three years a study was made of the temporal variation of the dust content of the lower hanced during this period because of the 1963 eruption of the volcano Agung in Java. Most of the observations of the dust layer were made at Lexington, Massachusetts during 1964 and 1965; some observations were also conducted at College, Alaska in the summer of 1964. Vertical profiles of aerosol concentrations were obtained by comparing the optical radar echoes with the expected return from a molecular atmosphere. The observations taken during a 2-year period show little temporal variability for the aerosol layer optical cross section. The average observed return from the layer was approximately 1.9 times the return from a molecular atmosphere the daily fluctuation of this scattering ratio was about 0.3, and hourly flucutations were smaller. The observed scattering ratios have been related to the number concentrations of particles illuminated by the laser beam by evaluating Mie scattering functions for backscattered radiation calculated particle concentrations were found to be in agreement with results obtained in independent studies by using other techniques that have been reported by other investigators. The data have been compared with various meteorological parameters associated with conditions in the lower stratosphere. A significant negative correlation between fluctuations of dust and ozone measurements has been found and the possible relationship between these constituents is being investigated. During the summer of 1964 optical radars were set up in Alaska and Sweden to study noctilucent clouds. The simultaneous occurrence of stratifications at the two stations was observed. Between 68 and 72 km the noise level was exceeded by almost 5 standard deviations. ##

08418

Morgan, George B.

AN EVALUATION OF AN AUTOMATED LABORATORY PROGRAM FOR AIR POLLUTION ANALYSIS. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((13))p., 1967. 2 refs. (Presented at the Technicon Symposium on Automation in Analytical Chemistry, New York, N. Y., Oct. 3, 1967.)

In order to increase analytical output and efficiency, the Laboratory Services Section, Air Quality and Emission Data Program, has automated most of the wet chemical analytical procedures. Adoption of these automated systems has resulted in increased precision and accuracy, as well as a fivefold increase in production. A cost analysis is presented for several of the more common analyses routinely encountered in the air pollution laboratory. Also discussed in the paper is a method that this laboratory uses for the determination of precision and accuracy for the Technicon Autoanalyzer, which should be equally adaptable to other automated analytical instruments. Automated chemical methods are routinely run in this laboratory for pollutants such as ammonia (ammonium), sulfate, nitrate, nitrite, nitrogen dioxide, sulfur dioxide, aldehydes, and total oxidant.##

08436

Manita, M. D., Rumyantseva, M. V., and Eglite M. E.

SPECTROPHOTOMETRIC DETERMINATION OF OZONE WITH DIHYDROACRIDINE IN THE ATMOSPHERE OF POPULATED AREAS.
((Spektrofotometricheskii metod opredeleniya ozona v atmosfernom vozdukhe naselennykh mest s reagentom-digidroakridinom.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.,) Sanit. (English translation of: Gigiena i Sanit.), 32(4-6:219-224, April-June 1967. 3 refs.
CFSTI: TT 67-51409/2

A spectrophotometric method is suggested for the determination of ozone in the atmosphere. It is based on measurements of the optical density of an ethanol solution of acridine produced by the action of ozone on dihydroacridine. The optical density of the sample solution is measured at a wavelength of 249.5 nm in a quartz cell of 1 =1 cm by an SF-4 spectrophotometer. This spectrophotometric method is suitable for determining ozone in the near-ground air layer in the presence of other oxidants with sufficient accuracy. The presence of ozone (in addition to other oxidants) was found in the near-ground air layer of a large industrial city such as Moscow.

08643

Dubois, L., A. Zdrojewski, and J. L. Monkman.

MEASUREMENT OF BENZO(a)PYRENE, BENZO(k)FLUORANTHENE AND BENZO(g,h,i)PERYLENE BY ULTRAVIOLET SPECTROSCOPY. Mikrochim. Acta, No. 5:834-842, 1967. 8 refs. (Presented at the Congress on Occupational Medicine, Budapest, Hungary, Sept. 1966.)

Published ultraviolet data for BaP in air may be grossly in error, particularly those published before 1960. It is not possible to measure BaP in air samples with accuracy, using the 401 nm peak, unless BaP is present alone (no BkF). The BaP detection limit measurable at 401 nm by ultraviolet is too high. The horizontal measurement technique produces results of greater accuracy than the base line technique. Better analytical values for BaP are obtained if, instead of using the peak at 401 nm, the 388 nm peak is used. BkF can be precisely measured using the 307 nm peak and a horizontal drawn at 314 nm. The technique for determining benzo((a))pyrene, benzo((k))fluoranthene, and benzo((g,h,i))perylene respectively in microgram amounts by UV absorption measurements is described. The feasibility of using this technique to analyze air samples has been investigated.

08644

Dubois, L., A. Zdrojewski, and J. I. Monkman.

COMPARISON OF THREE METHODS FOR TRACE ANALYSIS OF POLYCYCLICS. Mikrochim. Acta (Vienna), No. 5:903-911, 1967. 16 refs. (Presented at the Anachem Conference, Detroit, Mich., Oct. 11, 1966.)

Several analytical techniques for the determination of polycyclic aromatic hydrocarbons in air have been evaluated. Two solvents, benzene and cyclohexane, were compared for effectiveness in the preliminary preparation of the air sample. To identify and measure the polycyclics, the techniques of ultraviolet absorption and fluorescence were used. Air sample extracts were analyzed with and without prior chromatographic separation. A rapid chromatographic procedure using benzene as elutant was employed for th e first time. The extract aliquot or eluate fraction was chromatographed on fully activated alumina using benzene as the eluting solvent. BaP and BkF are eluted from such a column in 30 minutes or less in a total eluate volume of perhaps 50 ml and the two hydrocarbons are determined by fluorescence emission. Work in progress suggests that benzene may be replaced in this application by the less toxic toluene. By any method used the BkF values found were in good agreement. The agreement between the various BaP values was poor, suggesting not all were of equal validity. The highest, and also least accurate, BaP values seem to be associated with the use of benzene as extractant, or ultraviolet absorption as a measuring technique. (Authors# abstract)

08446

I. I. Gavrilova

METHODS FOR THE DETERMINATION OF SODIUM AND BUTYL 2,4-DICHLOROPHEN-OXYACETATES IN AIR. (Metody opredeleniya natrievoi soli i buty-lovogo efira 2,4-dikhlorfenoksiuksusnoi kisloty v vozdukhe.) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 32(4-6):394-396, April-June, 1967. 4 refs.
CFSTI: TT 67-51409/2

Different colorimetric methods for the determination of different preparations of 2,4-D in air were tested in order to determine which was most suitable for routine sanitary work. The 2,4-D herbicides are used in agriculture in the form of liquid aerosols and dust, while under actual working conditions they are present as dust. They should therefore be sampled on FPP-15 filters placed in metal cartridges, by means of electrical aspirators. It is recommended that the air for sampling 2,4-D herbicides be drawn up at a rate of 10 l/min. This was tested under working conditions and found to be the optimum rate.##

08487

Macku, Marcela

CHEMICAL ANALYSIS OF AEROSOL PARTICLES. METHOD FOR THE DETERMINATION OF NO3 AND NH4. ((Chemicke analysy aerosolovych castic. Metoda stanoveni NO3 a NH4.)) Text in Czech. Chem. Listy (Prague), 60(2):254-257, 1966. 12 refs.

The analysis of aerosol particles of individual compounds is of considerable interest for air pollution studies. Aqueous solutions of ammonium nitrate were atomized in a chamber and the aerosol was passed through a membrane ultrafilter at a rate of 7 l./min. The filter was then placed in a solution of 4% nitron in 10% acetic acid for 20 minutes. The spots which constitute a reaction product of NO3 with nitron were counted under a microscope. The NH4 particles were determined in a similar manner but with Nessler reagent. The spots did not fade after 6 months and the method was found to give reproducible results. Particle size distribution may also be determined.##

08681

Chapman, Robert L.

AN INSPECTION METHOD FOR AUTOMOBILE HYDROCARBON EMISSION. J. Air Pollution Control Assoc., 10(6):463-464, Dec. 1960. 5 refs. (Presented at the 53rd Annual Meeting, Air Pollution Control Assoc., Cincinnati, Ohio, May 22-26, 1960.)

There has been a need for a simple, inexpensive and extremely sensitive method for the discriminate detection of hydrocarbons in auto exhaust, that may be used by the law enforcing agencies. The use of the flame ionization detection method to fill this need, is discussed. The operation possibilities and limitations of this method are discussed.

08655

Ingram, William T., Jack Golden, Edward J. Kaplin, Martin P. Levine, and Raul R. Cardenas, Jr.

ADAPTATION OF TECHNICIAN AUTOANALYZER FOR CONTINUOUS MEASUREMENT WHILE IN MOTION. Preprint, New York Univ., N. Y. School of Engineering and Science, 22p., 1967. 7 refs. (Presented at the Technicon Symposium "Automation in Analytical Chemistry," Oct. 4, 1967.)

The development of a system of mobilized sulfur dioxide measurement that will make a traverse of a large community a possibility in a matter of one to two hours and permit from six to twelve repetitive measurements over a selected course in a 24 hour period is discussed. The mobilized measurement system has been used on traverse work since December 1966 and in the past months has operated on a 24 hour per day basis. It was determined that the best instrument was the Auto Analyzer. "Van-type" vehicles were used for the mobile sampling units. Two men were placed in the van to perform the work. One man is basically the driver and the other man monitors the instruments and notes appropriate data. Exploratory routes were traversed in and around the New York metropolitan area. In order to convert the mobile unit to a one man operation several costly modifications are being field tested. The Auto Analyzer may be calibrated using known amounts of sodium meta-bisulfite solution. The effect of NO2 interference in the Auto Analyzer methodology to detect and measure concentrations of sulfur dioxide is discussed.

08674

Strange, John P., Kenneth E. Ball, and Donald O. Barnes

CONTINUOUS PARTS PER BILLION RECORDER FOR AIR CONTAMINANTS.- J. Air Pollution Control Assoc., 10(6):423-426, Dec. 1960. 3 refs. (Presented at the 53rd Annual Meeting, Air Pollution Control Assoc., Cincinnati, Ohio, May 22-26, 1960.)

A continuous monitoring system, capable of high sensitivity and instantaneous response for a large number of noxious or toxic air contaminants has been developed, using a unique combination of chemical and physical detection principles. Sensitivities in the range of parts per billion are usually obtained with ease. For many compounds, a full scale range for less than 100 ppb is quite feasible. The method is not completely specific, although enhancement of the response to one compound in a mixture can usually be attained. Each application should be studied carefully to take advantage of all discriminating techniques and summation of co-existing toxic contaminants when practical from the viewpoint of hazard.

08692

Plata, H. L.

CALIBRATION AND COMPARISON OF COULOMETRIC AND FLAME IONIZATION FOR MONITORING PAN IN EXPERIMENTAL ATMOSPHERES. Preprint, California Univ., Riverside, Statewide Air Pollution Research Center, 8 p., 1968. 7 refs. (Presented at the 9th Conference on Methods in Air Pollution and Industrial Hygiene Studies, Pasadena, Calif., Feb. 7-9, 1968.)

A method of calibrating flame ionization and coulometric detectors for the analysis of PAN is described. Flame ionization for rapid sampling of moderately high concentrations is linear in the range 1-100 ppm. One ppm PAN gave a 0.30 mv response. The coulometric sensor used for continuous sampling at lower concentrations (0.5 - 30 ppm) is also linear. One ppm PAN gave a 0.29 mv response in a 500 ohm load resistor and was 3% of the thecretical stoichiometric value for ozone. (Author's summary)

08720

Briskman, R. N. and J. M. Weinberg

INVESTIGATION OF INTERFEROMETRY FOR THE ANALYSIS OF ENCLOSED habitable atmospheres. Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio, Aerospace Medical Div., Contract AF-33-(615)-3374, Proj. 6373, Task 637302, AMRL-TR-66-236 184p., Feb. 1967. 6 refs.
CFSTI, DDC: AD 655396

In order to develop a small and highly sensitive optical spectrometry for providing repeatable qualitative and quantitative analysis of contaminant gases in enclosed habitable atmospheres, a feasibility study and measurements program was conducted. An infrared interferometer spectrometer was employed in conjunction with a gas absorption cell for trace gas analysis. During the program, spectra were taken of 43 compounds, 10 binary, 10 trinary, 5 five-order, and 1 fifteen-order mixture. Typical minimum detectable concentrations range from 1 to 40 mg/l. The results of this program have defined a system that will satisfy the criteria for a prototype flight instrument. The theory of the single and dual-beam interferometer spectrometer is described. (Authors' abstract, modified)

08724L

Corn, M., F. Stein, and N. Esmen

THE SHAPE OF ATMOSPHERIC PARTICLES. (PROGRESS REPORT, April 1, 1966 - Aug. 30, 1967.) Pittsburgh Univ., Pa., Dept. of Occupational Health, Grant PHS-AP-00431-02, API-5, ((67))p., Nov. 1, 1967. 24 refs.

Additional laboratory studies with the Goetz Spectometer have indicated that it is feasible to chemically analyze the entire width of the particle deposit, rather than count particles on the centerline deposit. The methods used to verify the proposed experimental approach and anlyses of data were verified by calibrations with Uranine dye aerosol. Recommended procedures can be used for determination of the size distribution of aerosol in the particle size range of 0.5 - 3.0 M aerodynamic equivalent diameter. Suspended particulate matter was sampled on a roof by means of a horizontal elutriator. Particles were classified according to the ratio of projected area diameter (dp) to aerodynamic equivalent diameter (de) and also according to particle shape. The value (dp/de) varied from 0.5 to 3.0. Estimates of the size frequency weight distribution of particles based on dp differed by as much as 500% from the distribution derived from de. The average range of occurrence of (dp/de) for different particle shapes was determined. High volume samplers were used to collect suspended particulate matter for determination of bulk density, true density Solid phase only), and total specific surface area by BET gas adsorption techniques. Average bulk density and standard deviation of seven samples collected over one to two week sampling periods was 0.594 plus or minus 0.051 grams/cc. Average true density was 2.147 plus or minus 0.205 grams/cc. Average Total Specific surface of eight samples was 2.81 plus or minus 0.86 sq.m./gram for samples degassed at room temperature. For the same samples degassed at 200 deg. C, average total specific surface area was 5.61 plus or minus 1.50 sq. m./gram. Efforts devoted to elemental, as well as anion and cation analyses of samples collected with the Goetz b8spectrometer are briefly described.

08762

Katz, Morris

GUIDE TO THE SELECTION OF METHODS FOR MEASURING AIR POLLUTANTS. Preprint. World Health Organization, Geneva (Switzerland), WHO/AP/67.29, 115p., 1963. 2 refs.

The contents of this review are: main purposes of air pollution investigations, units for expression of results, atmospheric sampling, selection of sampling procedure and apparatus, gas analysis methods, automatic sampling and monitoring instruments, recent advances in instrumentation for gas analysis, analysis of polycyclic aromatic hydrocarbons and carcinogenic air pollution, and indicators and other rapid methods for identification or measurement of air pollutants.##

08835

Dagnall, R. M., K. C. Thompson, and T. S. West

MOLECULAR-EMISSION SPECTROSCOPY IN COOL FLAMES. PART I. THE BEHAVIOUR OF SULPHUR SPECIES IN A HYDROGEN-NITROGEN DIFFUSION FLAME AND IN A SHIELDED AIR-HYDROGEN FLAME. Analyst, 92(1097):506-512, Aug. 1967. 11 refs.

A method is described for the determination of sulphur that involves simple measurement of the S2 band emission at 384 milli microns in a nitrogen-diluted hydrogen diffusion flame burning in air, or in a pre-mixed air-hydrogen flame burning inside a cooled sheath. Sulphuric acid may be determined by this technique in the range 6.4 to 500 p.p.m. of sulphur in the latter flame, or dissolved sulphur dioxide in the range 3.2 to 320 p.p.m. in either flame. The temperature of the flame most suitable for conversion fo sulphur species into S2 is established as 390 deg C. The analytical method proposed for sulphates is simpler than the indirect flame-photometric methods hitherto described, and means are suggested whereby the method may be used for the determination of any form of sulphur species. The analytical signal for sulfur varies linearly with the square of the sulphate-ion concentration in the test solution. (Authors' abstract)##

C0838

Hoover, Gary M., Charles E. Hathaway, and Dudley Williams

INFRARED ABSORPTION BY OVERLAPPING BANDS OF ATMOSPHERIC GASES. Appl. Opt., 6(3):481-487, March 1967. 9 refs.

The spectral transmission of carbon monoxide, nitrous oxide, and mixtures of the two has been studied in the 2200 per cm region, where overlapping absorption bands occur. With spectral slit widths sufficiently large to include several absorption lines, it was found that the observed spectral transmittance of a mixture is equal to the product of the transmittances of the components measured separately, provided that sufficient nitrogen is added to give the same total pressure for all samples. This result was also obtained for overlapping bands of nitrous oxide and methane in the 1300 per cm region. The present work confirms earlier studies of overlapping bands of CO2 and water vapor. An investigation of the possible breakdown of the multiplicative property of transmission for narrow spectral slit widths was inconclusive. (Authors' abstract, modified)##

08859

Nash, T.

COLORIMETRIC DETERMINATION OF OZONE BY DIACETYL-DIHYDRO-LUTIDINE. Atmos. Environ., 1(6):679-687, Nov. 1967. 12 refs.

Diacetyl-dihydro-lutidine (DDL) has the highest affinity for ozone of a variety of reagents tested. On an arbitrary but practical scale, it is ten times better than thio compounds and 500 times better than iodide. DDL is easy to prepare and simple to use; if air is bubbled through a dilute aqueous solution, the amount of ozone present can be estimated by measuring the loss in optical density at 4120 A. With this loss a new strong band appears at 3070 A but the compound responsible has not been identified: it is not diacetyl-lutidine, the usual oxidation

product of DDI. The molecular yield is not significantly different from that obtained using neutral buffered iodide, one of the recognized standards for ozone. There is little interference from peroxides, nitrogen dioxide or sulphur dioxide in the concentrations normally found in polluted air. (Author's abstract)##

08889

Dubois, L. and J. L. Monkman

THE ANALYSIS OF AIRBORNE POLLUTANTS. In: Pollution and Our Environment: Conference Background Papers. Vol. 3, Montreal, Canadian Council of Resource Ministers, Paper D25-3, p. 1-20, 1967. 23 refs. (Presented at the National Conference, Canadian Council of Resource Ministers, Montreal, Oct. 31-Nov. 4, 1966.) Available from the Canadian Council of Resource Ministers, 620 Dorchester Boulevard West, Montreal, Canada, $10.00 per volume.

Some specific problems in the sampling and analysis of pollutants are discussed illustrating some discrepancies in data already obtained. The analysis of H2S and BaP are emphasized to indicate that some data may be unreliable. Conclusions drawn from the discussion indicate that measuring techniques and sampling methods should be considered as an integrated whole. To avoid possible conflict, the use of direct reading recording instruments is preferred to batch sampling devices and methods. If the instrument or batch sampling method does not produce accurate results, efforts to measure a particular pollutant should be abaondoned until a satisfactory method has been developed. Much is being said about the setting of standards and criteria. If methods do not exist which can determine with accuracy the limit chosen, it is better to avoid, at least temporarily, the setting of a limit. All factors must be considered, including current data on toxicity and current ability to measure before deciding on a standard or limit. Data are not an end in itself but merely an intermediate from which conclusions and correlations may be drawn. It is better to spend some effort and money in the development of a better measurement technique than to continue to use methods which are known to be unsatisfactory.

08894

California State Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab.

RECOMMENDED METHODS IN AIR POLLUTION MEASUREMENTS. ((79))p. 1967. 2 refs.

Methods for both manual and continuous automatic atmospheric sampling and analysis of the common air pollutants are described. Methods described are: the Modified West Method for sampling sulfur dioxide; the Neutral Buffered Potassium Iodide Method for total oxidant content; the Saltzman Method

for nitrogen dioxide and nitric oxide; the Continuous Atmospheric Analysis for nitrogen dioxide, nitric oxide, and sulfur dioxide (Autometer); and the lead peroxide candle for measurement of atmospheric sulfur. Methods for measurement of C (sub1) through C (sub 5) atmospheric hydrocarbons and n-butyl cellosolve are also described. The explanations and directions for each method are presented in a manner to inform and guide qualified analytical chemists.##

09032

Richter, H. G., J. R. Smith, and E. C. Tabor

OZONE DETERMINATION: A COMPARISON BETWEEN CHEMILUMINESCENT AND KI TECHNIQUES. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air pollution Control, 20p., 1968. 9 refs. (Presented at the 9th Conference on Methods in Air Pollution and Industrial Hygiene Studies, Pasadena, Calif., Feb. 7-9, 1968.)

Continuous measurement of ozone, total oxidant, nitric oxide, and nitrogen dioxide concentrations were made at four major urban areas during the period from 15 September to 21 November 1967. Ozone concentrations were made using a chemiluminescent device. Total oxidant concentrations were measured using a microcoulomb ozone sensor and an oxidant instrument system. Oxides of nitrogen concentrations were also measured. Curves depicting the diurnal behavior of individual gases are examined, and various statistical and physical relationships are suggested. Interference tests conducted in the laboratory indicate that under certain known conditions the chemicluminescent measuring technique is reasonably specific for ozone. The difference between ozone and total oxidant concentrations at various times of the day are discussed. (Authors' abstract)##

09108

Deutsch, Samuel

ACID POTASSIUM IODIDE METHOD FOR DETERMINING ATMOSPHERIC OXIDANTS. J. Air Pollution Control Assoc., 18(2):78-83, Feb. 1968. 18 refs.

This investigation used an acid medium for sampling atmospheric oxidants. The acid iodide oxidant procedure was unaffected by air or oxygen, temperature variance, and reducing gases (sulfur dioxide and hydrogen sulfide.) The method possessed good color stability. The method also agreed favorably with the 1 or 2% neutral buffered iodide method when a chromium trioxide scrubber was required to remove the reducing gases from the latter procedure. The acid oxidant absorption solution of 13 ml in a midget impinger contained 10 ml of 1.5% potassium iodide in a 0.1N sodium hydroxide solution and 3 ml of acetic acid (1:5) which produced a solution of approximately 3.8 pH. Particulate matter was

removed by a glass wool attachment to the midget impinger. The air was sampled with a Gelman Sequential Sampler at the rate of 1.41 liters per minute. After the oxidant sample was collected, the absorbing solution was transferred to a graduated cylinder and the volume was adjusted to 25 ml with distilled water. The absorbance was read at 355 millimicrons wavelength by a spectrophotometer in a 1 cm cell. The acid oxidant method was effective between 1 to 70 ppm of ozone. (Author's abstract)##

09111

Chapman, Robert L.

THE ROLE OF OPTICS IN AIR POLLUTION MONITORING. Opt. Spectra, 1(3):15-18, 1967.

Optical instrumentation and analysis techniques commonly used in air pollution monitoring are described. Beginning with a definitive description of major air pollutants and their causes, the article traces the development and use of optical instruments for this purpose from the "beginning" more than two decades ago to present. Comprehensive descriptions of instruments and techniques currently in use and a brief discussion of developments that would still further enhance the value of optical instrumentation in this application are presented.##

C9208

National Council for Stream Improvement, Inc., New York, N. Y.

A LABORATORY STUDY OF A LEAD-ACETATE-TILE METHOD FOR THE QUANTITATIVE MEASUREMENT OF LOW CONCENTRATIONS OF HYDROGEN SULFIDE. Atmospheric Pollution Tech. Bull. 15, 47p., Aug. 1962.

A simple, qualitative method for hydrogen sulfide utilizing lead acetate on the surface of a ceramic tile was evaluated on a quantitative basis in an apparatus in which low concentrations of hydrogen sulfide were maintained. The effects of hydrogen sulfide exposure, air turbulence, relative humidity dimethyl sulfide, dimethyl disulfide, methyl mercaptan and several possible interferences upon the rate of formation of colored lead sulfide on the tile surface, were investigated. Slightly exposed tiles can show a measurable response to a hydrogen sulfide concentration of 0.1 over a 6 minute time interval. The accuracy of the lead-acetate-tile method has been found to depend upon at least three factors: (a) the position of the average absorbance of the tile surfaces on the darkening curve, (b) the degree of air movement under which the hydrogen sulfide exposure is carried out, and (c) the fading of the lead sulfide color. To establish whether or not a tile surface has been overexposed, the difference between whether or not a tile surface has been overexposed, the difference between the reflectance spectrums on the curve, may be utilized. An increase in turbulence in the laboratory detention chamber has been found

to increase significantly the rate of darkening. Under outdoor conditions the turbulence level in the exposure chamber must be either standardized by an air mover or reduced to a minimum by louvering. Outdoor fading tests performed in a louvered, light-protected chamber indicate that in an 8-hour exposure period the maximum loss of Exposure Units would be in the order of 20 percent. A similar loss in Exposure Units under conditions unprotected from direct sunlight and wind would require approximately 10 minutes. The extremely high fading rate of darkening tiles exposed to direct sunlight and wind shows that hydrogen-sulfide-exposed tiles must be protected after removal from the exposure chamber as well as during exposure. The sources, effects, atmospheric concentrations and the methylene blue and A.I.S.I. sampler methods for the determination of H2S are also reviewed.##

C9234

Martinelli, Giorgio

THE CONTINUOUS CONTROL OF AIR POLLUTION WITH INDUSTRIAL ANALYSERS. ((Il controllo continuo dell inquinamento atmosferico con analizzatori industriali.)) Text in Italian. Termotecnia (Milan), 21(10):558-565, Oct. 1967.

For protection against air pollution from increased vehicular traffic, urbanization, and industry, Italy established a law on air pollution control in August 1966. Some provisions of the law are cited. A monitoring system for continuous measurements of air samples involves wind direction, registration of concentrations, determination of pollutants, and the emitter. Better results could be obtained from a network of monitoring stations at various cities, and a plan is proposed for their establishment and operation, where continuous measurement would also be made of air temperature and humidity, concentrations of SO2, H2S, NO2, CO2,CO, and hydrocarbons. Photographs showing equipment and apparatus for the stations are reporduced. A schematic diagram depicts the picoflux apparatus for SO2 measurements; an electrical cell for measuring H2S is also shown. The URAS infrared analyzer is used to measure CO2. Analyses for CO, hydrocarbons and dust are discussed, along with the equipment for air pollution monitoring in Frankfurt, Germany.

09333

Lial W. Brewer, (ed.)

ANALYTICAL PROCEDURES FOR THE ENVIRONMENTAL HEALTH LABORATORY. Sandia Corp., Albuquerque, N. Mex., Industrial Hygiene Lab., SC-M-3044, 147 p., Feb. 1968. 13 refs.

This is a manual compiled of thirty-nine analytical procedures used by an industrial hygiene laboratory. The procedures for the following substances in air are included: The Determinaton of Acetone, Acid and Alkali Contaminants; Benzene,

Toluene, and Other Aromatics; Beryllium (Spectrographic Method); Beryllium (Morin Method); Cadmium; Chromic Acid, Chromates, and Dichromates; Formaldehyde; Lead; Methanol; Nitrogen Dioxide; Oil Mist; Ozone (Colorimetric Method); Ozone (Titration Method; Phosgene; Silica (Colorimetric Method); Sulfur Dioxide; Thallium; and Zinc.##

09369

Wilson, H. N. and G. M. Duff

INDUSTRIAL GAS ANALYSIS: A LITERATURE REVIEW. Analyst, 92(1101):723-758, Dec. 1967. 712 refs.

Analytical methods are reviewed for: permanent and inorganic gases; analysis of liquefied or pure gases; fuel gases; flue gases; motor exhaust gases; analysis of micro samples; and atmospheric pollutants. The years from 1958 to about mid-1966 were covered. In no branch of analysis is the swing towards physical methods more marked than in gas analysis. There have been no important developments of the conventional methods during the last ten years; the chief advances have been the application of galvanic methods to "trace" of certain gases, and gas chromatography. The rapid spread of the electrogalvanic methods for the "on-stream" determination of traces is also most significant. The other most noticeable feature is the vast and increasing attention being paid to atmospheric pollutants of all kinds, particularly sulphur dioxide, sulphuric acid and hydrocarbons.##

09515

California State Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab.

A GUIDE TO OPERATION OF ATMOSPHERIC ANALYZERS. SDPH-2-40, 14p., May 1966.

Methods for both manual and continuous automatic sampling and analysis of the common air pollutants are described. Experiments are described for the measurement of sulfur dioxide using the West method. Total oxidant content of the atmosphere is analyzed using the Neutral Buffered Potassium Iodide Method, C1 through C5 atmospheric hydrocarbons are monitored and analyzed. Guides to the operation of atmospheric analyzers are reviewed.##

09573

Price, J. G. W., D. C. Fenimore, P. G. Simmonds, and Albert Zlatkis

DESIGN AND OPERATION OF A PHOTOIONIZATION DETECTOR FOR GAS CHROMATOGRAPHY. Anal. Chem. (U.S.), 40(3):541-547, March refs.

A comprehensive study was made of a photoionization detector for gas chromatographic systems. Performance compared favorably with the best of the ionization detectors currently employed in gas chromatography. The signal currents were almost three orders of magnitude greater than those of commerical flame ionization detectors. A noise level of 1 X 10 to the minus 13th power ampere was obtained under normal operating conditions. The linear dynamic range of this device is approximately 1 X 10 to the 5th power. Best performance was achieved by operating at reduced pressure using a dc discharge in argon and employing hydrogen as the carrier gas. The use of helium and other sources of high energy photons as discharge gases appeared considerably complicated by even trace amounts of impurities. Detector response to numerous organic and inorganic compounds was determined and successful applications were made in the fields of air pollution analyses. The extreme sensitivity and potential selectivity of this detector appear to be its most promising features. (Authors' abstract, modified)

09623

Barringer, A. R. and B. C. Newbury

REMOTE SENSING CORRELATION SPECTROMETRY FOR POLLUTION MEASUREMENT. Preprint, Barringer Research Ltd., Rexdale, (Ontario) ((13)) p., 1968. (Presented at the 9th Conference on Methods in Air Pollution and Industrial Hygiene Studies, Pasadena,

A correlation spectrometer has been developed for use in situ or for remote measurements of uncontrolled systems such as the measurement of the components of the atmosphere. This instrument offers an electrooptical technique for real time correlaion analysis of a pre-determined component by simple optical means enabling a direct readout to be obtained related to the concentration and path length of that component. The physical basis for the operation of the correlation spectrometer is discussed. The applications of this instrument to methods employing ambient light and artificial light are reviewed. Future applications for this technique in air pollution are reviewed.

09721

Hofmeister, H. K., H. Hummel, and R. Kohlaas

CONTINUOUS DETERMINATION OF NO2 AND (NO + NO2) CONCENTRATION IN CHEMICAL PLANTS. ((Kontinuierliche Bestimmung der Konzentration von NO2 und (NO & NO2) in chemischen Produktionsanla- German. Chem. Ingr.-Tech. (Weinheim), (1/2):61-64, Jan. 1968. 4 refs.

An apparatus is described for the continuous determination of NO2, or NO + NO2, in the gas stream of chemical production facilities. A photometer suitable for plant operations is used for the direct measurement of NO2 levels. NO is oxidized to NO2 (using I2O3 at 110 deg. C.) and the concentration of total NO2 is then determined. A dilution process was developed in order to avoid the extraordinary difficulties involved in the determination of degree-

of-oxidation at high levels of nitrogen oxides. The apparatus, which is described and illustrated by graphs, diagrams, and one photograph, was tested in a nitric acid absorption plant.

09770

Townsend, C. R., G. A. Giarrusso, and H. P. Silverman

THIN FILM PERSONAL DOSIMETERS FOR DETECTING TOXIC PROPELLANTS. Magna Corp., Redonodo Beach, Calif., Research and Development Div., Contract AF-33(615)-1751, Proj. 6302, Task 630203, AMRL-TR-66-231, 59p., Feb. 1967. 1 ref.
1967. 1 ref. CFSTI, DDC: AD 652849
CFSTI, DDC: AD 652849

The subject of this report is the development of a portable system for the detection of low concentrations of nitrogen tetroxide (N2)4), fluorine (F2), and unsymmetrical dimethylhydrazine (UDMH) in air. The detection system is based upon the change of electrical resistivity of thin metal films when exposed to these gases. Silver metal films coated with appropriate salts proved to be applicable to the detection of all three gases; however, the following sensitized metal films were found to be optimum: for N2O4, silver; for F2, copper; and for UDMH, gold. Using the best film and salt combinations found to date, N2O4 could be monitored over the range of 0.1 to 50 ppm, F2 over the range 1.0 to 50 ppm, and UDMH over the range 10 to 100 ppm, with a standard deviation of about 20 percent. The effects of temperature over the range 50 deg. to 90 deg. C and of humidity from 10 to 90 percent on the response characteristics of the thin film sensors were found to be significant but within the tolerance limits. Means for reducing these effects were suggested which, if successful, would, in effect, make this detection system practically independent of changes in the environment. A portable breadboard readout instrument was designed and fabricated for use with the sensors to form an integrated detection system for personal protection. (Authors' abstract)

09906

Vernot, E. H.

AUTOMATIC ANALYSIS OF NO2 IN A TOXICOLOGY LABORATORY. Preprint, Aerojet-General Corp., Toxic Hazards Research Unit, Contract F33615 -C-1025, AMRL-TR-67-178, ((13))p., ((1967)). 7 refs.

An automatic analyzer has been used in the control of NO2 concentration in exposure chambers. A series of inhalation toxicity studies required an experiment which included the three month exposure of a large group of animals to nitrogen dioxide. Two chambers were needed. It became necessary therefore, to control the contaminants more precisely since a small constant difference might have led to different effects in each of the chambers which were theoretically at the same concentration. For this control analyzer was the automatic analyzer was used with

Saltzman reagents. A description is given of the chamber and the sampling and analysis procedure. The system was in operation over the three month exposure period, and results show that it gave satisfactory indication of deviations in concentration. The analyzer was also used in a reduced pressure experiment which is also described.

C9907

Toyama, Y. and J. Kobayashi

NOTES ON AN OZONE GENERATOR AND ITS CALIBRATOR. Papers, Meteorol. Geophys. (Tokyo), 17(2):65-75, 1966.
6 refs.

The design and operation of a simple ozone generator and its calibrator is described. The generator is designed to operate over a range of zone concentrations from 20 to 100,000 microgram/cu m. The operation of the generator is based on the so-called spark discharge method. It consists essentially of a discharge tube and a dehydrator and gives reasonably constant ozone concentration air stream during the calibration of ozone sensors. The calibrator is designed to operate over a range of ozone densities from 20 to 600 microgram/cu m. It is based on Faraday's law of electrolysis, and the fact that the ozone concentration in the air can be determined by measuring the time needed for consuming a known amount of sodium thiosulfate in a potassium iodide solution. It is almost similar to Ehmert's method. The whole system, both the generator and the calibrator, gives a measuring error within plus or minus 3 percent. (Authors' abstract)

C9969

Chevalier, C. E.

A SPECTROPHOTOMETRIC DETECTOR FOR OXIDES OF NITROGEN. Pennsylvania State Univ., University Park, Dept. of Mechanical Engineering, Contract PHS-86-63-112, PSU-21, 16p., Aug. 1966. 4 refs.

A "dry" method is described which was developed by Nicksic and Harkins for the measurement of the nitrogen oxide content of automobile engine exhaust gases. It involves vapor phase oxidation of nitric oxide, the main nitrogen oxide in the exhaust gases, to nitrogen dioxide and determination of the concentration of the latter by means of a spectrophotometer. Nitrogen dioxides absorbs light energy strongly in the region of 320 to 500 millimicron while the other exhaust gas constituents do not. Satisfactory agreement between this method and wet methods, either the phenodisulfonic method or the widely used Greiss-Saltzman method has been shown. The Nicksic-Harkins method had been modified by substituting a suitably filtered light system for the monochromator source. The instrument described here, duplicates that modification but incorporates a few additional refinements. The calibration procedure is described and detailed operating instructions are given. (Author's abstract, modified)##

09983

Ubl, Z.

UNIFIED METHODS FOR THE ANALYSIS OF POLLUTANTS IN THE FREE ATMOSPHERE. Acta Hygienica, No. 1, Suppl, 1966. 84p. 24 refs.

Methods for the analysis of pollutants in the air are presented with precise and complete notes dealing with procedure, apparatus, reagents, and possible problems. Procedures are given for determining the following compounds in the air: SO2, CO, NO2, NOx, sulfuric acid aerosols, Cl2, H2S, Pb compounds, CS2, phenol, As, F2, NH3, soot, Mn compounds, SiC2, and formaldehyde. Also discussed are methods of air sampling, calibration methods, calculations, sensitivity and error in the determinations interferences from other compounds, and the principle involved in the method.

10034

Meyer, R. T.

FLASH PHOTOLYZED REACTIONS MONITORED BY TIME-OF-FLIGHT MASS SPECTROMETRY. Sandia Corp., Albuquerque, N. Mex., Aerospace Sciences Div., SC-RR-68-162, 20p., April 1968. 28 refs. (Presented at the "Symposium on Applications of Mass Spectrometry to Gas Phase Reactions," 155th National Meeting of the American Chemical Society, Division of Water, Air, and Waste Chemistry, San Francisco, Calif., April 4, 1968, Paper 55).
CFSTI: TID 4500 (51ST ED.)

The techniques of flash photolysis and time-resolved mass spectrometry have been combined for the study of fast gas phase reactions. The apparatus provides an incident ultraviolet light flux of 1.0 x 10 to the 18th power quanta per cm2 per flash and a spectrometer sensitivity of 5 x 10 to the minus 8 power mole per liter. Time resolution is 1.4 micron sec. at successive 50 microns sec intervals. The following chemical systems have been investigated: 1) nitrogen dioxide sensitized reaction between hydrogen and oxygen; 2) decomposition of nitromethane; 3) termolecular recombination of iodine atoms in the presence of nitric oxide; and 4) reaction of excited iodine (2P1/2) atoms with methyl iodide. The most promising development for pollution studies seems to be the use of nitrogen dioxide as a sensitizer and primary reactant. It should be possible to explore the reaction kinetics of nitrogen dioxide as a sensitizer and primary reactant. It should be possible to explore the reaction kinetics of nitroge dioxide and various hydrocarbons with this technique. The mass spectrometer sensitivity limit of 1 part per 100,000 will not permit, however, reproducing the dilution factor normally experienced in the actual atmospheric environment (approximate range 0.01 to 1 part per 10 to the 6th power).##

10100

F. Sianu, C. Radulian

THE DETERMINATION OF OZONE IN AN INDUSTRIAL ENVIRONMENT. (Contributii la determinarea ozonului in mediul industrial.)) Text in Romanian. Igiena (Bucharest), 15(9):561-566, 1966. 8 refs.

Volumetric and spectrophotometric methods are described for measuring ozone in industrial environments. Ozone (03) absorbs excess ultraviolet radiation in the atmosphere but if too much ozone is present too much ultraviolet radiation is absorbed. This condition can lead to rickets in humans, and therefore the concentration of ozone must be monitored constantly. The combination of ozone with nitrogen oxides and peroxides near chemical plants is of interest to toxicity studies. A sensitive colorimetric qualitative determination of ozone is described. An oxidation-reduction method that involves a silica gel preparation and an absorption apparatus is also described. This is considered a specific method sensitive to 0.001 mg. under the conditions established and is reproducible with ordinary laboratory equipment. The stoichiometric liberation of two atoms of iodine from a molecule of ozone is also briefly reported. Tabulated data indicate the amount of iodine (in mg.) in 10 ml. solution, iodine loss, and time and speed of collection. The combined effects of nitrogen oxides and ozone reported in the literature are discussed, but no significant conclusions are drawn. There is some evidence that these oxides interfere with the oxidant action of ozone in the vicinity of a chemical plant.##

10242

Dimitriades, B.

METHODS FOR DETERMINING NITROGEN OXIDES IN AUTOMOTIVE EXHAUSTS. Bureau of Mines, Washington, D. C., RI 7133, 29pp., May 1968. 10 refs.

Five direct and indirect methods for determining nitrogen oxides in automotive exhausts have been evaluated from the standpoint of accuracy and applicability in current exhaust studies. These methods are: static oxidation in tank, Bureau of Mines method, Chevron Research method, phenoldisulfonic acid method, and direct measurement of NO. Results showed that methods requiring conversion of nitric oxide to nitrogen dioxide as a part of the analytical procedure are subject to errors introduced by the instability of NO2. The extent of some of these errors has been determined, and procedures have been developed to minimize undesirable influences. On the basis of the results obtained from this study, recommendations are made regarding procedures for batch type or continuous measurement of nitrogen oxides in exhaust streams.##

10296

Peterson, Carl M. and Harold J. Paulus

CONTINUOUS MONITORING OF AEROSOLS OVER THE 0.001- TO 10-MICRON SPECTRUM. Am. Ind. Hyg. Assoc. J., 29(2):111-122, March-April 1968. 10 refs.

Three aerosol sizing and counting instruments were combined into a single automatic system capable of continuously providing data pertinent to the physical properties of airborne particulates ranging in size from 0.001 to 10 microns. Particle sizes are determined by either condensation, light scattering, or electrical phenomena. All three methods are required to measure broad-size aerosol spectrums, as each individual method possesses accurate sizing characteristics over a limited size range. The instruments, combined into a unitized system, provide data on particles within various interval widths and group the respective sized particles according to the interval midpoint. An appropriate electrical signal, indicative of the number of particles present, is recorded by electronic instrumentation, and subsequent calculations result in a complete number-size distribution. This paper describes the union of the condensation nuclei counter, the light-scattering counter, and the electrical particle counter with associated data acquisition equipment to produce a workable system. Data reduction, as applied to the determination of a number-size distribution, is also discussed. (Authors' abstract, modified)##

10297

Piekaar, H. W. and L. A. Clarenburg

AEROSOL FILTERS--THE TORTUOSITY FACTOR IN FIBROUS FILTERS. Chem. Eng. Sci., 22(12):1817-1827, 1967. 27 refs.

A theoretical derivation is given of the tortuosity factor for a flow through fibrous filters, based on purely geometrical considerations. The resulting expression for the tortuosity appears to be a function of filter and fiber properties. For laminar air flow the tortuosity factor is calculated as a function of porosity and of filter composition. Although the resulting curves are in quantitative agreement with the experimental work of Sullivan, frequently referred to, there is much evidence that Sullivan did not measure tortuosity alone. Finally the tortuosity factor is calculated for electrical flow through fibrous filters saturated with a conducting liquid. Theoretical and experimental results are in excellent agreement. Therefore it may be concluded that it is not justified to take the constant value 2, derived from electrical measurements, for the tortuosity factor of laminar air flow through fibrous filters. (Authors' summary)##

10315

A. German, J. Fanouse-Perrin and A. M. Quero

COLORIMETRIC MEASUREMENT OF OZONE. (Dosage colorimetrique de l'ozone.) Text in French. Ann. Pharm. Franc. (Paris), 25(2):115-120, Feb. 1967. 2 refs.

The reaction of O3 with a mixture of N-phenyl-2-naphthylamine and o-dichloro-benzene is studied. Development of the brown-orange color is not inhibited by the presence of O2 or nitrogen oxides so that the intensity of the color produced is proportional to the amount of O3 present. A special apparatus for use with this reaction is described, consisting primarily of a spherical cell, described previously, which is used for bubbling. Comparative analyses with the Guereau apparatus (iodometric analysis) indicate that this photometric method is sensitive to levels which are below the olfactory threshold (0.026 ml O3). At this low concentration, the air with ozone must be bubbled through the reagents for 30 min.##

10357

Shaw, J. T.

INSTRUMENTAL METHODS FOR THE DETECTION OF HIGHER OXIDES OF NITROGEN IN NITROUS OXIDE. Brit. J. Anaesthesia (Altrincham), 40(4):299-303, April 1968. 7 refs.

Two instrumental methods used by the British Coal Utilisation Research Association for flue gas analysis are discussed. Both the Hersch sensor and the Mast meter respond to any substance capable of giving rise to a galvanic reaction in its electrochemical system. Both are sensitive to 1 ppm v/v of NO2, or, when supplemented by a pre-oxidizer, to 1 ppm of NO and NO2. Both appear suitable for installation at manufacturers' work or at the clinic for routine continuous monitoring.##

10406

J. V. A. Novak

CONTINUOUS POLAROGRAPHIC ANALYZERS. I. THE DROPPING MERCURY ELECTRODE AS A REFERENCE ELECTRODE. ((Dlouhodobe polarograficke analysatory I. Rtutova kapkova elektroda jako elektroda referentni.)) Text in Czech. Chem. Listy, 49:277-288, 1955. 26 refs.

Polarographic curves obtained with two dropping mercury electrodes are described and their characteristics discussed. One electrode serves the same purpose as any conventional polarographic arrangement and the other serves as a reference electrode instead of the conventionally used mercury pool.

This arrangement is important for long-term analyses since the dropping mercury electrode is not polarized. Instruments for continuous analysis of titanium and iron ions and for determining small concentrations of CO, the concentration of iodine is continuously recorded which is liberated from iodine oxide by the action of the CO in the analyzed gas. This analyzer is useful for CO concentrations from 0.01-0.0001 vol%.##

10489

Bufalini, J. J.

GAS PHASE TITRATION OF ATMOSPHERIC OZONE. Preprint, Public Health Service, Cininnati, Ohio, National Center for Air Pollution Control (8)p., April 1968. 9 refs.

Ozone can be selectively removed from a gas stream containing a variety of oxidants. Oxidant analysers can be made specific for ozone by incorporating a small gas reaction chamber on the instrument. Possible interferences from hydrogen peroxide, n-butyl hydroperoxide, peroxyacetyl nitrate, nitrogen dioxide, and peracetic acid are discussed. (Author's abstract)

10513

Wartburg, Arthur F. and James P. Lodge, Jr.

ESTIMATING CONCENTRATION OF AIR POLLUTANTS. Chemsitry, 41(2):29 32, Feb. 1968 13 refs.

Fairly accurate but inexpensive equipment for measuring oxidants, SO2, and suspended particulates can be made for about 4100. A vacuu pump draws air through a simple filter for measuring particulates, a bubbler of iodine-starch solution for measuring SO2, or a bubbler of iodine-starch-thiosulfate solution for measuring oxidants. Calibration and calculation methods are presented. The apparatus is completely described and could easily be built from the information given.

10518

Engelhardt, Heinz

A GAS ANALYSER FOR THE MEASUREMENT OF IMPURITIES IN AIR. Instr. Review, 15(194):98-99, Feb. 1968 Translated from German, Electrotech. (B), No. 2, 1966.

A gas analyzer has been introduced which measures air impurities such as SO2, HC1, NH3, NO, NO2, CO, C12, and H2S. The instrument, called Picoflux, operates on an electrocunductivity principle. The various air contaminants are analyzed by using different electolyte solutions in the voltiac cell; if several gases are present, preliminary filtration is also employed. The instrument is suited for measuring low concentrations; 0 to 0.3 ppm SO2; 0 to 0.5 ppm HC1

and 0 to 1 ppm NH3. The range is adjustable by a factor of 2.5 or 5 with the flick of a switch. An integrating recorder allows 10- or 3 minute mean measurement readings.

10528

Matson, Wayne Reimer

TRACE METALS, EQUILIBRIUM AND KINETICS OF TRACE METAL COMPLEXES IN NATURAL MEDIA. Thesis (Ph.D), Massachusetts Inst. of Tech., Cambridge, Dept. of Chemistry, Contract Nonr-1841(74), Proj. DSR-74913, 258p., Jan. 1968. ((61)) refs.
CFSTI, DDC: AD 666554

A composite mercury graphite electrode (CMGE) has been constructed and has been shown to follow the theoretical behavior for thin film electrodes. Its physical structure has been studied, and correlated with its electrochemical behavior and stability. An analytical system capable of performing multiple analysis of metal ions has been built using the CMGE and the analytical precision has been investigated over the range of 10 to the minus 7th power to 10 to the minus 10th power M. Anodic stripping techniques using the CMGE have been developed for obtaining information on the complicated distributed of the trace elements Zn, Cd, In, Pb, Cu, Bi, in samples from the environment, and for obtaining parameters related to the formation constant K, and the rate constants for naturally occurring trace metal complexes of these metals and several others - Fe, Mg, Co, Ni, U. Techniques have been developed for separating molecular weight fractions of complexes and complexing agents in water samples. A portion of the trace metals atmospheric samples have been shown to be bound to particulate material of greater than one micron diameter. A ubiquitous nonlabile trace metal component has benn identified in all fresh waters. A quantitatively and qualitatively different nonlabile components is present in some sea water samples. Up to eight different nonlabile complexing agents have been identified in one sample. The data indicate that the high molecular weight complexes are at least in part humic acid type compounds. Estuarine and surface mechanisms whereby nonlabile materials can be removed have been studied briefly. A complicated distribution of strong labile complexes which is apparently associated with biological activity has also been identified in many waters. (Author's abstract)##

10585

Rosenberg, G. V. and G. I. Gorchakov

THE DEGREE OF ELLIPTICITY OF POLARIZED LIGHT DISPERSED IN THE ATMOSPHERIC AIR AS A TOOL FOR STUDYING THE MICROSTRUCTURE OF AEROSOLS. (Stepen ellipticheosti polyarizatsii sveta rasseyannogo atmosfernym vozdukhom kak sredstvo issledovaniya mikrostruktury aerozoliya.) Text in Russian, Fiz. Atm. i Okeana (Moscow), 3(7):699-713, July 1967. 20 refs.

Data are analyzed on the ellipticity of polarized light and the degree of polarization coherence for light dispersed in the ground layer of the atmosphere at various intensities of haze. It is shown that haze particles are frequently anisotropic. Calculated results are given for the angular relationship of the degree of ellipticity of polarized light scattered by small spherical particles. It is shown that the measurement of the degree of ellipticity can be used for studying the kinetics of transformation of aerosol particles during the formation and disintegration of atmospheric haze.##

10658

Beard, J. Taylor and William R. Teele

THE QUANTITATIVE DETERMINATION OF GASEOUS AIR POLLUTANTS BY LONG PATH INFRARED TRANSMISSION SPECTROSCOPY. Preprint, Virginia Univ., Charlottesville, Dept. of Mechanical Engineering, and Naval Air Systems Command, Washington, D. C., ((17)) p., 1968. 17 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-28, 1968. Paper 68-119.)

Average quantitative detection of CO, CH4, SO4, and O3 in ambient air may be accomplished through use of infrared transmission spectrometry. A long dual-path technique for determination of the above pollutants is presented. An analytical development of the theory for this technique is presented. This involves an adaptation of Beer's Law for multiple absorbing gases and an assumption that a dual-path spectrometer system can provide differential and ratio signal processing. Also included is a provision for cancelling the losses due to haze scattering and an analysis of the resulting error, which can be made very small. Sample calculations show that ambient pollution levels of CO and CH4 can be measured over a short path (100 meters) and that SO2 and O3 can be measured over a longer path (2000 meters). It is concluded that this technique may be useful as an ambient air pollution detector and that experimental work should be done to determine this application. (Authors' abstract, modified)##

10663

Anderson, Willard E.

IONIC MOBILITY AS RELATED TO ATMOSPHERIC MONITORING AND CONTROL. Preprint, Honeywell Inc., St. Paul, Minn., Systems and Research Center, 11p., 1968. 4 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 1968, Paper 68-158.)

A progress report on a study to adapt the concept of ionic mobility to atmospheric trace gas identification and measurement i presented. Of special interest has been the Eriksen air-blast mobility spectrometer because of its simplicity and relatively hig resolving power. Trace constituents definitely affect the

current-voltage-flow characteristics, but a unique relationship between effect and constituent has not yet been obtained. Discussed are future efforts to obtain such a relationship by in part reducing the ion collection time.##

10672

Hersch, Paul A.

CONTROLLED ADDITION OF EXPERIMENTAL POLLUTANTS TO AIR. Gould-National Batteries, Inc., Minneapolis, Minn., 24p., 1968. 21 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul,Minn., June 1968, Paper 68-153.)

Experience with, and extensions of less known techniques of providing an air stream with a steady and adjustable level of a gaseous impurity are described. Leaving aside those means that employ moving solid parts, the paper discusses devices using liquid pistons, mikro-flow through channels, diffusion across channels and barriers, stream splitters for attenuation, and methods based on evaporation, electrolysis, chemical conversion, and irradiation. (Author s abstract, modified)

10772

Yamamoto, Robert K., and Warren A. Cook

DETERMINATION OF ETHYL BENZENE AND STYRENE IN AIR BY ULTRAVIOLET SPECTROPHOTOMETRY. Am. Ind. Hyg. Assoc. J., 29(3):238-241, May-June 1968.

In the production of styrene, it is important to be able to determine ethyl benzene and styrene in the presence of each other as an indication of sources of dispersion of vapors from the closed reaction system. The air is drawn at a fixed rate through a fritted -glass bubbler containing spectro-grade isooctane. The absorption of ultraviolet light at wavelengths of 268 mu for the ethyl benzene and 291 mu for the styrene is used as a measure for the amounts of these compounds collected from the air. This method has the advantages of sampling over a wide range of concentrations, of specificity, and of facility in both field and laboratory phases. (Authors abstract)

10816T

Coenen, Wilfried

DUST MEASUREMENT AND RECORDING BY THE METHOD OF SMALL ION ACCUMULATION. ((Registrierende Staubmessung nach der Methode der Kleinionenanlagerung.)) Translated from German. Staub, 24(9):350-353, Sept. 1964. 9 refs.

A commercially available apparatus for dust measurement is described mathematically. The described instrument, which measures ionization levels of the dust, is found suitable in principle for dust measurement. This instrument will measure practically the whole range of suspended particulate matter. The effects of air temperature and air pressure upon ionization are expressed mathematically. When used in conjunction with a gravimetric measuring instrument, this instrument may be able to determine the mean radius of an unknown particle size distribution.##

10902T

Sprenger, Gerhard

THE SPECTROGRAPHIC IDENTIFICATION OF NITRIC OXIDE OCCURRING IN AN INTERMEDIATE FASHION IN THE REACTION BETWEEN NITROGEN PENTOXIDE AND OZONE. ((Die spektorgraphische Identifizierung des in der Reaktion zwischen Stickstoffpentoxyd und Ozon intermediar auftrendtenden Stickoxydes.)) Translated from German. Z. Elecktrochem., 37(8-9):674-678, 1937.

The reaction between nitric pentoxide and ozones was studied spectrographically at 20-40 degree C and NO3 was identified as an intermediate product. The chain reaction mechanism was formulated and the calculated rate constant was found in good agreement with that obtained from kinetic data.##

10960

Chapman, R. L.

AIR POLLUTION CONTROL SYSTEMS. Instr. Control Systems, 41(8):79-82, Aug. 1968.

The methods for measuring the major air pollutants are reviewed briefly. Some of the problems involved in calibration of instruments are discussed.##

11030

Hanst, Philip L. and John A. Morreal

DETECTION AND MEASUREMENT OF AIR POLLUTANTS BY ABSORPTION OF INFRARED LASER RADIATION. Preprint, 27p., 1968. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-91.)

A technique of detecting gaseous air pollutants by means of absorption of laser radiation is under development at the NASA Electronics Research Center. The iodine infrared laser and the carbon dioxide infrared laser are forced to emit spectral lines which fall on the infrared absorption bands of atmospheric

pollutants. The attenuation of a laser line when passed through an air sample is the measure of the pollutant concentration. The narrow spectral width of the laser emission permits sensitive detection, minimizes interference between pollutants, and allows penetration of atmospheric water bands. The collimation and high power outputs available from lasers permit transmission of the radiation over long straight paths through the atmosphere and over long folded paths in multiple-pass absorption cells. A sample of absorbing gas placed within the laser cavity forces the emission of the selected wavelengths. With a one-half kilometer path to a retro-reflector and back, it is predicted that the following concentrations of air pollutants will be detected by means of the indicated laser lines: carbon monoxide at 2 parts per million in air (ppm), using the 10.53 micron carbon dioxide line; sulfur dioxide at 1.5 ppm, using the 9.08 micron carbon dioxide line; and ozone at 0.15 ppm, using the 9.52 micron carbon dioxide line. It seems feasible to extend the technique to other pollutants such as nitrogen dioxide, methane, butane, and peroxy acetyl nitrate. Continuing effort is being devoted to development and construction of the laser transmitting and receiving equipment. Field testing is planned for the near future.##

11043

A. Alvarez

CONTINUOUS DETERMINATION OF TRACES OF SO2 IN AIR, USING WATER AS THE ABSORBING SOLUTION. Preprint, New York State Dept. of Health, Albany, Div. of Air Resources, ((24))p., 1968. 3 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-69.)

A method for the continous determination of traces of SO2 in air, using water as the absorbing solution is presented. It is based on measurement of the color yield by the reaction between sulfur dioxide (as sulfate) and p-rosaniline hydrochloride-hydrochloric acid-formaldehyde mixture. The p-rosaniline methyl sulfonic acid produced in the reaction exhibited a maximum absorption at a wavelength of 560 millimicrons. The color was observed to be temperature independent within the range of 65 degrees F to 76 degrees F and stable for a period of our hours. Interferences from NO2 and NH3 were observed at levels beyond the concentrations existing in average urban air. The method described in this paper exhibited a higher degree of sensitivity than the standard West-Gaeke method when they were tested in parallel. (Author's abstract, modified)##

11051

O. C. Taylor, E. R. Stephens, E. A. Cardiff

AUTOMATIC CHROMATOGRAPHIC MEASUREMENT OF PAN. Preprint, California Univ., Riverside, Statewide Air Pollution Research Center, 9p., 1968. 11 refs. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minnesota, June 23-27, 1968, Paper 68-70.)

A gas chromatograph which is equipped with an electron capture detector has been automated for monitoring ambient air for the smog component peroxyacetyl nitrate (PAN). The instrument injects a sample every 15 minutes and about 1.5 minutes are required to develop the chrcmatogram. The minimum detectable quantity is about one ppb although this could be pushed lcwer if there were need. In about eleven months of operation the maximum concentration was 58 ppb. On many occasions substantial concentrations persisted overnight. (Authors' abstract)##

11061

H. W. Theones, W. Guse

LATEST STATE OF DEVELOPMENT OF INSTRUMENTS FOR THE CONTINUOUS MONITORING OF GAS EMISSIONS. Staub (English translation), 28(3):53-63, March 1968. 17 refs.
CFSTI: TT 68-50448/3

Fcr the measuremet of gaseous emissions, testing methods using chemical analysis are used for emission control based on randcm sampling while automatic gas analyzers are employed for continuous concentration control. The different types of measuring instruments, their possibilities and limitations are explained, and difficulties occcurring during gas cleaning are considered. Practical experience is available which has been gained in many years during the operation of gas cleaning installations and of analysers for continous measurement of sulphur dioxide present in flue gas. (Authors' summary)##

11108
Coleman, Paul D. and Roberto Roldan

ELECTRICAL PROPERTIES OF MATERIALS IN THE FAR INFRARED REGION. (FINAL REPORT 1 FEBRUARY 1965 - 31 JANUARY 1967.) ILLINOIS UNIV. Urbana, Electro-physics Lab., Contract AF-AFOSR-272-65, Proj. 9767-02 AFOSR-68-0465, 8p., (22) refs.
CFSTI: AD 669573

A vacuum monochromator for the 80 to 1000 micron range, under construction for the past year, is described. Initial data on the rctational spectra HCl, HBr, N20% CH3Cl and CH3CN were taken to test the performance characteristics of the instrument. Performance data indicated that the monochromator characteristics are wavelength reproduction 0.1%; wavelength calibration 0.5%; relative intensity measurement 5 to 104; and a resolution of 2% in the 300 to 700 micron range using a carbcn bolometer detecter and a scan time of 1 hour. (Authors' summary, modified)

11130L

Saltzman, Bernard E.

METHODS OF MEASURING AND MONITORING ATMOSPHERIC NITROGEN OXIDES AND THEIR PRODUCTS. (Part I.) World Health Organization, Geneva, (Switzerland), WHO/AP/68.31,99p., 1968. (93) refs.

A working text of NOx measurement methods in common use is presented. Sufficient details are provided so that no additional material should be needed to conduct the analysis. However, abundant references are provided. The actual texts of methods which have been selected by appropriate organizations are quoted in exact form. Measuring and monitoring atmospheric nitrogen oxides are complex because of the fact that many interrelated oxides and products exist. These undergo chemical reactions and equilibria both in the atmosphere and in air sampling apparatus. The effects of the various substances are different. Their interferences also differ for various analytical procedures. Therefore to fully expound the problems in making these measurements, an introductory section is presented giving chemical and physical properties, various reaction rates, and equilibrium data. In these analyses we are seeking to measure concentrations that vary both in time and space. Rational design of a sampling program therefore requires a knowledge of these distribution patterns. Only then can we clarify the effects of sampling time, numbers of sampling locations, numbers of samples collected, and correlate these with the objectives which are sought. These topics therefore also are included.

11132

Tagaki, Sadayuki F.

NEUROPHYSIOLOGICAL STUDIES ON THE OLFACTORY RECEPTIVE MECHANISM (FINAL REPORT). Gunma Univ., Maebashi, Gunman-ken, (Japan), Grant DA-CRD-AFE-S92-544-67-G67, Proj. DF-9777, Task 01-004FE 3-271-3, (19)p., April 1968.
CFSTI, DDC: AD 671678

In the previous experiment of the first year, the ionic mechanism of the negative slow potential elicited by odors in the olfactory epithelium (EOG) was negative EOGs are generated by the entry of Na ions and the exit of K ions through the receptive membrane but not by the entry of Cl ions. As a continuation of the above experiment, the ability of mono-, di- and trivalent cations to substitute for Na ions was examined this year. When Na ions in Ringer's solution was replaced by one of these cations, the negative EOG decreased in amplitude and in many cases disappeared. When Na ions and K ions were exchanged in Ringer's solution, the negative EOGs reversed their polarity. When recovery of these reversed (originally negative) EOGs were examined in the Ringer's solutions in which Na ions was replaced by one of the cations, they recovered only partially and the recoveries were not maintained. Only when K ions was replaced by Na ions (normal Ringer's solution), the negative EOGs recovered completely and could maintain their amplitudes. Thus, the indispensability of Na ions was proved. The cation permeability was considered on the basis of the ion size. By means of a microelectrode, differential sensitivity to various odours of single olfactory cells were shown. The mechanism of olfactory fatigue was studied by recording the response of the olfactory nerve twigs. The result indicates that the olfactory adaptation essentially occurs in the higher olfactory centers. The importance in olfaction of the trigeminal nerve was shown by recording the responses to many kinds of odors. This nerve is more sensitive to camphoraceous, peppermint and pungent odors than the olfactory nerve. In order to clarify the mechanism of odors discrimination in

the olfactory bulb, four camphoraceous and four peppermint odors were applied and the numbers of the spike discharges of single cells to these odors were counted. Good correlations were generally found between the numbers of spike discharges and the profiles of the odorous molecules, although there were some exceptions. (Author's abstract, modified)

11162

Proctor, T. D.

A LASER TECHNIQUE FOR THE MEASUREMENT OF AEROSOLS. J. Sci. Instr. 1(6):631-635, June 1968.

The paper describes the use of a continuous-wave helium-neon laser to measure the surface area of small concentrations less than 3000 particles per cu m of dust particles, of size less than 5 microns, suspended in air. The suspension is passed through a size-selector to remove dust particles greater than 5 microns in size and then into a chamber between one of the laser mirrors and the end of the laser tube. Scattering and absorption of radiation from the cavity by the dust particles causes a change in the amount of radiation reflected back into the laser tube, which in turn produces a reduction in the intensity of the output beam. The relationship between the surface-area concentration of the airborne dust and the change in the output intensity is derived, and experiments with an instrument of this type are described and discussed. (Author's abstract)

11197

Hunter, H. H. and R. I. Mitchell

PORTABLE SMOKE PHOTOMETER. Preprint, Battelle Memorial Inst., Columbus, Ohio, Columbus Labs.,pp. 928-940 (1968). 1 ref.

A solid-state photometer has been designed and constructed. This photometer has a linear response and is suitable for use with conventional optics used in smoke penetrometers. The instrument uses solid-state devices rather than vacuum tubes, and requires no warm-up time. Preliminary results indicate that its sensitivity is comparable to existing vacuum-tube units. The instrument also has a constant-intensity light source in which the light intensity varies only plus or minus 1.4 percent when the line potential varies from 100 volts to 130 volts.The optics portion of the instrument is still under development and needs further modification. (Authors' summary)

11237

J. C. Chipman, A. J. Hocker, and John Chao

MEASURING AND EVALUATING AUTOMOBILE EXHAUST HYDROCARBON EMISSIONS BY INTERRELATED TECHNIQUES. Preprint, California Air Resources Lab., Los Angeles, ((19)) p., 1968.

10 refs. (Presented at the 61st Annual Meeting, American Institute of Chemical Engineers, Symposium on Research and Development in Automotive Air Pollution Control, Los Angeles, Calif., Dec. 1-5, 1968, Paper 53-E.)

The smog forming potential of exhaust gas from a 216 car survey was determined. This potential is defined in terms of reactivity units. Exhaust hydrocarbon emissions were measured by nondispersive infrared, ultraviolet and flame ionization analyzers. The measurements of these analyzers were correlated with the reactivity of the exhaust gas. The results show that each analyzer is capable of delineating the smog potential of gasoline powered vehicles. Hydrocarbon emissions were also correlated with engine classes. The emission level differences for concentration are larger than those obtained on a reactivity or mass rate basis. (Authors' summary) ##

11305

Heck, Walter W., Frank L. Fox, C. Stafford Brandt, and John A. Dunning

TOBACCO, A SENSITIVE MONITOR FOR PHOTOCHEMICAL AIR POLLUTION. Preprint, Department of Agriculture, Beltsville, Md., Crops Research Div. and Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 30p., 1968. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-192.)

The development of a technique by which the sensitive tobacco variety, Bel-W3 is used as a monitor for photochemical air pollution is discussed. The technique uses the plant as an indicator of the oxidant complex in both urban and rural areas. Two pilot studies that were conducted over a 3-year period during the development of the monitoring technique are included in the discussion. Attention is given to an explanation of the proper procedures for planting, transplanting, fertilizing, and caring for mature plants. The methods used in determining and recording damage to plant leaves is included; the studies showed almost daily injury to monitoring plants. (Authors' abstract) ##

11406

V.G. Kunde

THEORETICAL MOLECULAR LINE ABSORPTION OF COIN LATE SPECTRAL TYPE ATMOSPHERES. National Aeronautics and Space Administration, Greenbelt, Md., Goddard Space Flight Center, 33p., Dec. 1968. ((73)) refs.
CFSTI: NASA TN D-4798

The line positions, line intensities, and collisional half-widths have been calculated for the fundamental, first-overtone, and second-overtone vibration-rotation bands of C12O16 and C13O16.

The C12O16 and C13O16 line intensities were computed for temperatures ranging from 175 to 3500 degrees K and were weighted in accorance with a terrestrial C12/C13 abundance ratio. All lines within 5 to 6 orders of magnitude of the maximum line intensity of a band have been considered (about 4500 lines at 3500 degrees K).##

11476

Andreeshcheva, N. G.

THE EFFECTS OF CERTAIN AROMATIC HYDROCARBONS IN THE AIR. ((O sanitarno-toksikologicheskoi otsenke nekotorykh aromaticheskikh uglevodorodov v atmosfernom vozdukhe.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):13-17, April-June 1968. ((10)) refs.
CFSTI: TT 68-50449/2

A spectrophotometric method of determining meta-nitrochlorbenzol (MNCB), and 3,4-dichloraniline (3,4-DCA) in the air is elaborated. The findings point to a definite relation of the threshold values of smell to the changes in the chemical structure of the substance due to introduction of nitro-amino- and chlorine groups into the benzol ring. The action of chlorine products on the light sensitivity of eyes becomes stronger as additional chlorine groups, besides the nitro- and amino- groups, are being introduced into the benzol ring.##

13493

Rakowski, Robert F.

EVALUATION OF THE USE OF COMMERCIALLY AVAILABLE DETECTORS FOR HYDRAZINE AND NITROGEN DIOXIDE AS COLORIMETRIC DOSIMETERS. Aerospace Medical Research, Wright-Patterson AFB, Ohio, Medical Div., Proj. 6302, Task 630203, AMRL-TR-68-163, 5p., Feb. 1969. 4 refs.

The color response of several commercially available detector papers for hydrazine and nitrogen dioxide was determined in order to evaluate their usefulness as personal dosimeters. The Bug-it H25b Hydrazine Detector gave satisfactory results in the concentration-time (CT) range of toxicological interest. Appropriate color standards should be prepared and a reusable holder for the detector strips manufactured. The Bug-it H30A Nitrogen Dioxide Detector was satisfactory as a detector for low concentrations of nitrogen dioxide, but did not give colors which darkened enough to permit a quantitative estimate of the CT product to which the strips were exposed. Melpar Nitrogen Dioxide Detector tapes were also satisfactory as a detector for low concentrations of nitrogen dioxide, but since the color developed did not darken at all with increasing time, it was not possible to estimate the CT product of an exposure with this detector. Tables show the response of the three detector papers. (Author's abstract modified)

11498

Aigina, E. P., G. S. Lopukhova, and S. S. Khikmatullaeva

SPECTROPHOTOMETRIC DETERMINATION OF THIOPHENE IN AIR.
((Opredelenie tiofena v vozdukhe spekrofotometricheskim metodom.))
Hyg. Sanit. (English translation of: Gigiena i Sanit.),
33(4-6):409-411, April-June 1968. ((1)) refs.
CFSTI: TT 68-50449/2

The spectral characteristic of thiophene in the wavelength range 220 - 250 millimicron, using ethanol, methanol, heptane, hexane and octane as the solvents was studied. Measurements of the optical densities of methanol solutions of thiophene with concentrations up to 15 micrograms/ml at lambda = 231 millimicrons showed these solutions to obey the Lambert-Beer law. Therefore the concentration of thiophene in the solution can be determined from the optical density using a calibration graph, or calculating from an equation. For determinations of thiophene in air in the presence of benzene, another variant was elaborated making use of Vierordt's method. This method makes it possible to determine concentrations of each of the components of a binary mixture from the optical density of solution. The spectral characteristics of methanol solutions of benzene and thiophene are shown. Thus, two variants of the spectrophotometric method are proposed for the determination of thiophene in air. The first variant, proposed for hygienic experiments, is based on measuring the absorption of UV radiation by the methanol solution of thiophene at lambda = 231 millimicrons. Its sensitivity is 0.5 micrograms per 1 ml solution. Benzene in concentrations of up to 20 micrograms/ml does not interfere with the determination. The second variant, proposed for determination of thiophene in air in the presence of benzene, is based on measurements of absorption of UV radiation by a thiophene -- benzene mixture in methanol at 231 and 254.6 millimicrons. The thiophene concentration in the solution is calculated from an equation. This variant is used in the presence of benzene concentrations exceeding 20 micrograms in 1 ml methanol.##

11562

Ewald, Herbert and Gustav Emrich

ANALYSIS OF THE INTERESTING COMPONENTS OF EXHAUST GASES.
((Die Analytik interessierender Abgasbestandteile von Auspuffgasen.)) Text in German. Freiberger Forschungsh.,
(A387):133-161, 1966. 146 refs.

Recent methods for the determination of CO, CO2, NO, NO2, hydrocarbons, and hydrocarbon combustion products in air and exhaust gases are reviewed in detail, with a discussion of their relative sensitivity, accuracy, and convenience. Data are also presented on the concentrations of some of these components during the operation of gasoline and diesel engines under various conditions. The sensitivity of various methods for the determination of some of these components and the prices of some

of the analytical equipment (gas chromatographs, mass spectrometers, photometers, other spectrometers, and gas analyzers) required are given in tabular form. It is concluded that rapid testing or testing performed in mobile laboratories usually must be made by Orsat analysis or test capsules, while continuous measurements of exhaust gas components for control purposes can be done photometrically. For most purposes, ultraviolet and mass spectrometery have been replaced by gas chromatography, which is cheaper and more informative; however, spectrometric techniques are useful for identifying component detected by gas-chromatograph. Although basically a discontinuous process, gas chromatography can be automated.##

11567

Hood, L. V. S., and J. D. Winefordner

THIN-LAYER SEPARATION AND LOW-TEMPERATURE LUMINESCENCE MEASUREMENT OF MIXTURES OF CARCINOGENS. Text in English. Anal. Chim. Acta, 42(2):199-205, Aug. 1968. 16 refs.

Low-temperature fluorescence and phosphorescence characteristics of a number of polynuclear aromatic hydrocarbons are reported. Complex mixtures of hydrocarbons were studied to determine the selectivity of low-temperature luminescence measurement. Low-temperature fluorimetry is applied to measure several hydrocarbon carcinogens after ethanolic extraction from thin-layer chromatograms. The method described permits determination of 0.1 micrograms of most of the potent carcinogens (such as pyrenes, anthracenes, perylenes, tryphenylenes, etc.). The results suggest that the method may be well suited for environmental studies of hydrocarbon pollution.##

11573

Lahmann, Erdwin

STUDIES ON AIR POLLUTANTS. II. MEASUREMENT TECHNIQUES AND EVALUATION. ((Die Untersuchung von Luftverunreinigungen. German. Bundesgesundheitsblatt, (11):161-167, May 26, 1967. 29 refs.

The second part of a detailed review of techniques for measuring the concentration of air pollutants deals with various parameters of the sampling procedure which affect the results of all analytical methods. These parameters include: the duration of the sampling period (or frequency of measurements), duration of the study, season and time of day when the samples are taken, frequency of discontinuous sampling, air density at the measuring sites, height of the sampling sites above the earth, and distribution of the sampling sites. The effects of some of these parameters on determinations of atmospheric SO2 and CO are shown by way of illustration. Sampling programs used in the German Federal Republic, Great Britain, and the USA (National Air Sampling Network and Continuous Air

Monitoring Program) are described briefly. Finally, some of the problems arising in the evaluation of experimental air pollution data are pointed out (such as the skewed rather than Gaussian distribution of results).##

11574

Lahmann, Erdwin

STUDIES ON AIR POLLUTANTS. I. ANALYTICAL METHODS. ((Die Untersuchung von Luftverunreinigungen. I. Analysenmethoden.)) Text in German. Bundesgesundheitsblatt, (10):145-150, May 12, 1967. 71 refs.

This detailed review of the apparatus and techniques used for air pollution measurements deals with both sampling and analytical methods. A distinction is made between empirical or discontinuous and continuous methods of sampling and it is pointed out that only the latter can yield readily interpretable results. In connection with gas sampling techniques, the value of an impinger for increasing the rate of dissolution of gaseous pollutants is discussed. Methods are then described for the quantitative determination of SO2, SO3, NO2, NO, CO, H2S, HF, and NH3, and brief mention is made of the techniques of gas chromatography and flame ionization detection for traces of organic compounds. The two principal techniques for estimating the total particulate content of the air are dust-fall and dust-concentration determinations. The latter which depends on photoelectric measurement of the particle density after filtration is more difficult to perform, but more interesting from the health point of view.##

11604

Heinz, Winfield B., Naum S. Bers, William Burns, and Lawrence Lewis

HIGHWAY DYNAMICS AND AUTOMOTIVE EMISSION TEST PROCEDURES. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39, p. 63-71, Sept. 1968. 8 refs.

Information about the influence of sudden changes in automobile speed on smog formation is being obtained with a portable magnetic recorder equipped to record as many as 32 channels of data on three tracks, while using a fourth track for audio monitoring of tests in progress. In addition to speed, torque, manifold pressure, and throttle position, the instrument also records temperatures, fuel flow, air flow, accelerations, engine rpm, etc. The recorder is suitable for use in tests exploring the total content of engine exhaust stream emissions. It is suggested that future research can evaluate emissions from many different automobiles in a short time by subjecting each to programs of tape recorded speed and torque.

11622

Charlson, R. J.

ATMOSPHERIC AEROSOL RESEARCH AT THE UNIVERSITY OF WASHINGTON. Preprint, Washington Univ., Seattle, Coll. of Engineering, 13p., 1968. 10 refs. (Presented at the Air Pollution Control Association Meeting, St. Paul, Minn., June 1968.)##

Useful developments both in instrumentation (in the integrating nephelometer) and in experimentation are reported. Mass and visibility are related by the expression: magg x Lv = 1.2 gram/m2, which is mentioned and explained briefly. Other research efforts in progress are centered on the atmospheric aerosols, rather than laboratory aerosols. Size distribution studies are being correlated with simultaneous optical measurements. Chemical analysis methods are being developed for single particles via scintillation methods. The spatial variation of aerosol concentration in the vicinity of cities is also being studied, both with the nephelometer and with laser radar (lidar). (Author's abstract, modified)##

11675

Sawicki, E. and C. Golden

TLC-FLUORIMETRIC ANALYSIS FOR ATMOSPHERIC SCOPOLETIN. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Chemical and Physical Research and Developmetn Program, 19p., July 1968. 19 refs.

A method is described for the characterization and assay of scopoletin, a hydroxycoumarin derivative previously identified in tobacco and tobacco smoke. The evidence for its presence in airborne particulates, house dust, and coffee roast effluents consists of R(f) values obtained with silica gel thin-layer chromatography and mobility values obtained with paper electrophoresis, as well as fluorescence spectra obtained from the chromatogram and from methanolic, alkaline methanolic, and sulfuric acid solutions. By use of a procedure involving thin-layer chromatography spectrophotofluorimetry, scopoletin was assayed in these various samples. Recovery of scopoletin from enriched airborne particulates was 97%. The various separations and fluorimetric examinations revealed the presence of a large number of 'oxygenated' fluorescent unknowns in the various samples; these substances will be studied for possible allergy significance. (Author abstract modified)

11738

Nash, T.

CHEMICAL STATUS OF NITROGEN DIOXIDE AT LOW AERIAL CONCENTRATION. Ann. Occupational Hyg., 11(3):235-239, July 1968. 4 refs.

Although the possible existence of nitrous acid as distinct from nitrogen dioxide in polluted air has been recognized, the two compounds give the same product with colorimetric reagents and it has not been believed necessary to distinguish between them in routine investigations of air pollution or in toxicology. A simple sampling procedure has been developed using mixtures of nitrous acid and nitrogen dioxide in the ppm range. The compunds are separately estimated using Saltzman's reagent. Nitrous acid can form the major proportion of nitrous fumes from some sources, while nitrogen dioxide in moist air is slowly converted to nitrous acid. The method, results, and toxicological implications are given and discussed.##

11755

A. S. Denovan, R. W. Ashley

THE DETERMINATION OF OXIDES OF NITROGEN IN REACTOR LOOP COVER GAS. Atomic Energy of Canada Ltd., Chalk River, Ont., Chalk River Nuclear Labs., ((11))p., Sept. 1967. 3 refs.
CFSTI: AECL-2770

Procedures have been develcped using selective absorbers followed by gas chromatography which are suitable for the separation and determination of NO and NO2 either from a bulk gas sample or directly from a flowing gas stream of CO2 containing up to 2% air. Nitrous oxides can also be determined if required. With synthetic gas samples, recoveries were shown to be quantitative using the procedures outlined. Calculations from data obtained for the procedures outlined. Calculations from data obtained for the preparation of calibration curves showed the standard deviations to be plus or minus 3.2 microgram for NO, plus or minus 2.6 microgram for NO2 and plus or minus 5.5 microgram for N2O over the range of 15 - 150 microgram. Limits of detection were 200 ppb for NO, 60 ppb for NO2 and 200 ppb for N2O.##

11819

Ereuer, Wolfram

NEW METHODS OF CONTINUOUS TRACE GAS ANALYSIS. (Neue Verfahren zur kontinuierlichen Spurenanalyse). Preprint, 23p., 1968. 2 refs. (Presented at the Interkama Kongre, 4th, Duesseldorf, Germany, 1968.) Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 23p.

Electrochemical trace gas measuring units for determining the concentration of pollutants in the open air are described. The units operate on the principle of a galvanic chain, indicating concentration changes of ions in a solution caused by reaction with a sampled trace gas. The sampling gas and the solution are held by a solid electrolyte cast into a cylindrical silver tube which serves an an anode. The cathode is embedded in the inner surface of the electrolyte in the form of a silver helix. Electrical connections for both electrodes run through a polyethylene stopper at the bottom of the tube. The flow of sampled

gas reaches the actual measuring zone, the inner surface of the electrolyte, through a glass line and a polyethylene stopper at the top of the tube. The measuring ranges of standard units extend from several ppb (dilution of 10 to the minus 9th power) to several ppm (dilution of 0.000001, depending on the gas component. Concentration cells are now available for analysis of hydrogen sulfide, nitrogen dioxide, nitrogen dioxide and nitric oxide, phosgene, hydrogen cyanide, chlorine, oxygen, and ozone.

11834

W. E. Cobb

ION LOSSES IN THE GERDIEN CONDENSER INTAKE SYSTEM. J. Appl. Meteorol., 7(3):456-458, June 1968. 6 refs.

The measurement of atmospheric electrical conductivity, ion density, or mobility by the aspiration method may result in the undesired removal of ions within the air-intake system. (The specialist in atmospheric electricty cannot help but disturb the natural existence of the very element he wishes to investigate.) An investigation was made, at a field site 40 mi northwest of Washington, D. C., to determine the loss of small ions in different length intake tubes and for a wide range in the air flow rate. Two identical Gerdien conductivity instruments were operated simultaneously. One unit, with only 10 cm of intake pipe ahead of the Gerdien condenser, was operated as a reference standard, and the conductivity measurement was repeated as 60,200, and 370 cm lengths of 10-cm diameter intake pipe were added to the second unit. A constant flow rate of 400 cm/sec was maintained through the control unit, while in the second unit the flow was increased by steps from 40 to 500 cm/sec. Data were recorded on a multichannel oscillograph and the measurements were repeated many times in clean, winter air. There was little change from one measurement ot the next. The loss of original ions at flow velocities greater than 300 cm/sec varied from zero to 23% for the three intake lengths, while for flow rates less than 150 cm sec the loss of ions increased rapidly in each case. The sampling times varied from 0.1-10sec. Although the transfer of ions to the walls by eddy diffusion should increase for turbulent flow no such effect was detected; the increasing loss of ions, even as the flow became laminar, indicates that ion transit time is the controlling factor rather than air flow turbulence. A 1:1 ratio of the length to the diameter for the Gerdien intake system and an airflow without curves or obstruction is suggested. Since atmospheric electrical conductivity measurements are made primarily to determine secular trends in atmospheric fine-particle pollution, and since long-term changes may be only a few percent, it is imperative that such measurements be as absolute as possible.##

11842

V. Vcelak

DETERMINATION OF THE DEGREE OF OXIDATION OF BROWN COAL BY MEASUREMENT OF LIBERATED HYDROCARBONS. ((Die Bestimmung der

Oxydationsstufe von Braunkohle durch Nachweis freigesetzter Kohlenwasserstoffe.)) Text in German. Erdoel Kohl (Hamburg), 21(6):344-350, June 1968. (Presented at the 19th annual meeting of the German Society for Petroleum Science and Coal Chemistry, Hamburg, 5 Oct. 1968). 35 refs.

The presence of low-temperature oxidation in brown-coal mines is normally detected by the determination of CO and CO2 in the air. Experiments are now reported which show that even earlier stages of oxidation can be detected by determining the concentration of hydrocarbons (especially unstturated hydrocarbons) both in the mine atmosphere and adsorbed onto the coal. Samples of coal from several Czech coal mines were sealed in polyethylene under N2 and analyzed chemically and by gas chromatography. The degree of autooxidation of the sample was estimated in 3 ways: 1) from its chemical composition and the tar content following low-temperature coking; 2) from the course of degasification in the Brabender apparatus; and 3) from the hydrocarbons liberated from the coal during low-temperature coking or thermal decomposition. On this basis, the samples were classified into 5 groups: fresh coal (not oxidized), oxidized coal (but not yet glowing), ignited coal (glowing but not aflame), burned coal, and unoxidizable material. Whereas the amount of hydrocarbons (ethane, ethylene, propane, propylene and butane) liberated from fresh coal during degasification is negligible below 200 degrees C, but then increases rapidly with temperature, the amount liberated from oxidized coal shows two maxima, the first being a broad shallow maximum at about 150 degrees C followed by a minimum at 280 degrees C and then a rapid rise.##

11855

Hochheiser, Seymour and Walter F. Ludmann

FIELD COMPARISON OF METHODS OF DETERMINING ATMOSPHERIC NO AND NO2. Preprint, American Chemical Society, Washington, D. C., 17p., 1965. 13 refs. (Presented at the American Chemical Society 150th National Meeting Atlantic City, N. J., Sept. 13, 1965.)

Atmospheric samples from several cities were used in a comparative study of the Saltzman and Jacobs-Hochheiser methods of measuring atmospheric nitrogen dioxide concentrations. Nitric oxide is determined by these methods after wet oxidation of the NO to NO2 in a gas scrubber containing an acid-permanganate reagent. The reproducibility of the two methods for measuring NO and NO2 in 30-min samples was determined by collecting atmospheric samples in duplicate and analyzing the difference in results. For NO2 measurements, the reproducibility of the two methods was about the same; for NO, the reproducibility of the Jacobs-Hochheiser method was better. Reproducibility of both methods was better for NO2 measurements than for NO measurements, indicating perhaps that a permanganate bubbler adds to inherent and systematic errors. There were no appreciable differences in mean concentrations of NO and NO2 measured by either method in any city. The relationship of measurements obtained by both methods for 30-min sampling periods indicates that if the disproportionation factor for the Jacobs-

Hochheiser method is considered to be approximately 0.6 to 0.8, the two methods agree at NO2 concentrations greater than 0.05 ppm. Sulfur dioxide or NO at the concentrations encountered did not appear to affect the differences between NO2 measurements obtained by the two methods.

11903

Gronsberg, E. Sh.

DETERMINATION OF ACROLEIN AND VINYL-BUTYL ETHER IN THE AIR. ((Opredelenie akrcleina i vinil-butilovogo efira v vozduhe.)) Text in Russian. Gigien. Truda i Prof. Zabolevaniya, 12(7):54-56, July, 1968.

Air to be analyzed is passed (rate 20 l/hr) through 2 Petri adsorbers, each containing 4 ml of adsorbing-oxidizing mixture for acrolein (I) (100 ml 2% NH4 acetate + 4 ml 1.5% HIO4 or KIO4 in 5% KH2SO4 and 4 ml 2% KMnO4), or for vinyl-butyl ether (II) (100 ml 2% NH4 acetate + 8 ml 1.5% HIO4 in water and 4 ml 2% KMnO4). Both I and II are oxidized at the double bonds to formaldehyde. Oxidation is stopped after 15-30 min. by adding a few drops of 30% sulfite ((compound not specified)) to sample containing I, or 0.1 ml 5% H2SO4 and then a few drops of 30% sulfite to sample containing II. The samples (2ml) are then treated with 3.5 ml chromotropic acid solution (100 mg dissolved in 5 ml 10% H2SO4 to which 125 ml conc. H2SO4 are added), kept for 30 min in boiling water, and after cooling brought up to 9 ml. Quantitative determinations are made colorimetrically against standards of I and II treated in the same way as the samples. The method is selective for I in mixtures with saturated aldehydes, except formaldehyde, and also for II in mixture with butyl alcohol and acetylene, which occur in the air around manufacturing plants. Methanol in high conc., or compounds that may be oxidized to formaldehyde can interfere with the test. The sensitivity is 1 mg for I and 5 mg. for II.##

11922

W. Walisch

MEASURING SYSTEM FOR THE AUTOMATIC ULTRAMICRO DETERMINATION OF SULFUR IN ORGANIC COMPOUNDS. ((Messanordnung zur automatischen Ultramikrobestimmung von Schwefel in organischen Verbindungen.) Text in German, Mikrochim. Acta. ((Vienna)), Vol. (4):748-764, 1968. 15 refs.

A system is described which makes possible the analysis of samples weighing only 0.5 mg with an absolute accuracy of + or - 0.15%, at rate of 8 sulfur determinations per hour. The system depends upon the complete combustion of the organic sample in an empty tube provided with nozzles and eddy chambers, so that the combustion products can be driven into an adsorption tube, using O2 as a carrier, without leaving any residue. In the adsorption tube,

which is filled with quartz wool, the sulfurous products are oxidized to sulfate with H_2O_2, after which the sulfate is determined colorimetrically (645 nm) with $BaCl_2$ using "carboxyarsenazo" as the indicator. The endpoint is read by a photoelectric cell which transmits the abrupt voltage change to a transistorized difference amplifier feeding the motor of the piston burette. The lower limit of detection for this automatic titration system is 0.5 mg of sulfur as sulfate. The results of 30 determinations by this method on pure sulfur and organic compounds containing 12.89-42.12% sulfur (sample size of 0.275-1.166 mg) are reported.##

12004

Neerman, J. C.

CONTINUOUS MASS SPECTROMETRIC ANALYSIS OF AUTOMOTIVE EXHAUST FOR NITRIC OXIDE. In: Report on CRC Symposium on Exhaust Gas Analysis. Coordinating Research Council, Inc., New York, N. Y., Group on Composition of Exhaust Gases, CRC-RN-404, pp. 61-64, Sept. 21-22, 1965.

A small, portable mass spectrometer to monitor nitric oxide concentration in automotive exhaust is described. The combined response time of the instrument and sampling train is 3 seconds, which satisfactorily follows the California Motor Vehicle Pollution Control Board test cycle. The instrument gives rapid response. Interference by compounds which have the same mass as NO, such as a CO isotope, formaldehyde, ethane, and a nitrogen isotope, is discussed.##

12136

Altshuller, A. P., L. J. Lage, and A. F. Wartburg

SOURCE AND ATMOSPHERIC ANALYSES FOR FORMALDEHYDE BY CHROMOTROPIC ACID PROCEDURES. Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Lab. of Engineering and Physical Sciences, 17p., 1962 (?). 7 refs.

A variation of the chromotropic acid method of formaldehyde analysis was investigated, which employs direct collection and color formation in a 0.1% chromotropic acid solution in concentrated sulfuric acid, instead of the usual method involving preliminary collection in a bubbler containing an aqueous bisulfite solution or just water. A brief study was also made of the use of an aqueous solution of chromotropic acid. The aqueous procedure is not useable in analyses of diesel or incinerator effluents; the acid procedure is not applicable to raw and diluted auto exhaust, but both can be used to analyze synthetic and actual photochemical smog. Because of its much higher sensitivity, the acid procedure is convenient for formaldehyde analysis, even when the formaldehyde levels are only a few parts per hundred million by volume. At these concentration levels and below, the use of optical cells of 5-cm path length are advisable. Thus, for trace

gas analyses, direct collection in acid solution provides a more sensitive procedure that those various formaldehyde and aldehyde analytical methods that involve a 1-to-10 dilution step.

12140

Wartburg, Arthur F. and Bernard E. Saltzman

REMOVAL OF INTERFERING SULFUR DIOXIDE IN ATMOSPHERIC OXIDANT ANALYSIS. Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Lab. of Engineering and Physical Sciences, 18p., 1964 (?). 7 refs.

In order to improve the accuracy of iodimetric measurements of total oxidant consisting predominantly of ozone by manual and instrumental methods now in use, a solid absorbent material was developed for conveniently removing sulfur dioxide from an air sample stream with little or no concurrent loss of ozone. Chromium trioxide acidified with sulfuric acid, supported on glass-fiber paper, was the most effective of various scrubbing chemicals, and should make possible measurements of oxidant levels without serious interference from 100-fold excesses of SO2. The optimal area of absorbent paper for use in a 100-mm U tube at the test flow of 140 ml/min was about 6 sq in. A certain conditioning time is required before ozone is no longer appreciably absorbed; the concentration of chromium trioxide affected this time but not final performance. Work is in progress to determine whether the absorber causes any losses of the oxidant from natural and synthetic smog mixtures. Field tests completed to date indicate that the performance of the absorber does not deteriorate during ordinary continuous use for 30 days.

12148

Southerland, James H.

A SURVEY OF AIR POLLUTION IN THE CHATTANOOGA METROPOLITAN AREA. Preprint, 11p., 1969. 2 refs. (Presented at the Environmental and Water Resources Engineering Conference, 8th Annual, Nashville, Tenn., June 5, 1969.)

The procedures used for the Chattanooga, Tennessee-Rossville, Georgia Interstate Air Pollution Survey are presented. A general examination is given of the methods used in the conduct of the field investigation, including site selection, sampler selection, and frequency of sampling for particulates (high-vol samplers), sulfur dioxide (West - Gaeke and continuous automatic conductivity instruments), nitrogen oxides (Saltzman colorimetry), oxidants (colorimetry), and carbon monoxide. Brief descriptions of analytical techniques and procedures used for the study are presented, including the effects studies for materials, vegetation, and health, as well as the aerometric-meteorological network. Aspects of an emission inventory, air quality standards and implementation plans, and air quality improvement planning are discussed. A summary of findings will be presented in a forthcoming technical report. (Author abstract modified)

12196

Mueller, James I.

OZONESONDE, BUBBLER TYPE. (FINAL REPORT). Mast Development Co., Davenport, Iowa, Contract AFSC-F19628-68-C-0092, Proj. 8628, Task 862807, Unit 86280701, AFCRL-68-0409, 25p., July 31, 1968.
CFSTI DDC: AD 676780

A balloon-borne ozonesonde is described that measures ozone concentrations by means of an electrochemical reaction in a bubbler cell and transmits information to the ground by AN/AMT/4B, AN/AMT-12, or ESSA radiosondes. Test and flight experience indicate that all components of the ozonesonde are adequate to accomplish the required task without any modification of the radiosondes. A switching device provides a continuing cycle of three seconds of ozone data and seven seconds of meteorological data. At two and one-half minute intervals, the switch selects alternately between air pump temperature data and a calibration function. Sources of error are the destruction of ozone in the instrument before it can react in the bubbler; interference by oxidizing agents other than ozone and by reducing agents in tropospheric and surface air; and varying efficiency of the gas-liquid interaction with altitude. With careful handling, instrument destruction is five percent or less. Temperature effects can introduce a plus or minus three percent error. The bias cell voltage will decrease 25 mb during a flight, resulting in a maximum plus two percent error. The overall calibration factor determined by comparison of integrated flight profiles and spectrophotometer total ozone is 1.2 plus or minus 10%. (Author abstract modified)

12240

Nelson, G. O.

THE EFFECT OF HALOGEN COMPOUNDS ON THE MOLECULAR SPECTRA OF AIR. In: Hazards Control Progress Report No. 32 (September-December 1968) and Index to Hazards Control Progress Reports Nos. 30 through 32. California Univ., Livermore, Lawrence Radiation Lab., p. 38-46, 1969.
CFSTI: TID-4500

Nitrogen and nitric oxide spectra produced in an ac spark were enhanced by the presence of halogenated materials in air. This phenomenon was observed, irregardless of the concentration or species of halogenated hydrocarbons present in the chamber. The intensity change at a given concentration was greatest for chlorinated materials and decreased progressively for brominated, iodinated, and fluorinated compounds. Spectral intensity also increased with an increase in the number of halogens present on the molecule at a given concentration. The intensity increase for the halogenated materials was not altered significantly by the hydrocarbon side-chain length, configuration, or degree of saturation. The mechanism of interaction between the halogen and

nitrogen probably involves collisional processes with the nitrogen after electron attachment to the halogen. Excited N2 and NO subsequently give up energy as photons. This process makees possible selective halogen detection and estimation in the low-ppm range.

12338

Ellsworth, Edward

THE FEASIBILITY OF GLASS CULTURE TUBES AS DISPOSABLE CUVETTES IN COLORIMETRIC DETERMINATION OF OZONE AND NITROGEN DIOXIDE. Preprint, Air Pollution Control Association, New York City, 19p., 1969. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, N. Y., June 22-26, 1969.)

Glass culture tubes made of lint or borosilicate glass and measuring 13 by 100 mm were compared with cuvettes recommended for use with the Spectronic 20 Colorimeter. Ozone and nitrogen dioxide were sampled from exposure chambers, and after standard methods of analysis, optical densities were recorded. The ovality of the culture tubes was also compared to that of the cuvette at random rotated positions. The glass culture tubes showed no more variation in repeated optical density readings that did the cuvettes, nor was the culture tube less uniform in shape than the cuvette. Use of the disposable glass culture tubes can make manual ozone and NO2 colorimetric assays more rapid and economical without increasing technical variability. (Author abstract modified)

12362

Altshuller, A. P., S. L. Kopczynski, W. A. Lonneman, and F. D. Sutterfield

A TECHNIQUE FOR MEASURING PHOTOCHEMICAL REACTIONS IN ATMOSPHERIC SAMPLES. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 15p., May 1969. 12 refs.

Photochemical experiments were conducted on samples collected from the atmosphere in downtown Los Angeles during the morning traffic peak hours. The samples were collected in large, plastic containers fabricated from film transparent to solar radiation. The samples were analyzed, irradiated with solar radiation for 2-3 hours at ambient temperatures, reanalyzed, irradiated again for 2-3 hours, and reanalyzed. Analyses were made for aliphatic hydrocarbons, aromatic hydrocarbons, total hydrocarbon, nitric oxide, nitrogen dioxide, oxidant, formaldehyde, peroxyacetyl nitrate,and carbon monoxide. The separation on the pollutants was described. The maximum oxidant values obtained agreed reasonably well with those obtained at several air monitoring stations. The results clearly indicated the value of large plastic reaction containers in investigating the kinetic behavior of atmospheric samples at ambient temperatures with solar radiation.

12437

Carpenter, R. O., C. Schuler, and J. Pressman

ATMOSPHERIC NITRIC OXIDE MEASUREMENT TECHNIQUES (FINAL REPORT). GCA Corp., Bedford, Mass., Technology Div., Contract NAS12-85, GCA-TR-68-18-N, 87p., Nov. 1968. 80 refs.
CFSTI: N69 16504

A three-phase program is described to investigate and develop a suitable laser technique for measuring the vertical number density distribution of neutral nitric oxide in the atmosphere. A theoretical study was made to determine transitions of the ambient atmospheric NO molecule which offered the greatest promise for laser probing by the resonance scattering mechanism. This study centered on calculations of the ratio of integrated resonance scattering cross section to the Rayleigh scattering cross section; it was concluded that operations would have to be restricted to the far ultraviolet or far infrared. A developmental program was carried out to examine various methods for producing laser radiation from NO gas at transitions where the terminal state both corresponded to a well-populated state in atmospheric NO and whose characteristics made probing possible. Results showed that operating a direct NO laser at either far UV or far IF is not now practical. Experimental work was performed involving the shift-tuning of known high power lasers using harmonic generation, sum frequency generation, stimulated Raman shifting, and parametric oscillation. These techniques appear to offer reasonable means of generating radiation at the lines of interest. Detailed evaluations are given of the two optimum probe wavelengths for shift-tuning: UV 2155 A and IR 5.33 micron. (Author summary modified)

12666

J. N. Pitts, Jr., G. W. Cowell, D. R. Burley

FILM ACTINOMETER FOR MEASUREMENT OF SOLAR ULTRAVIOLET RADIATION INTENSITIES IN URBAN ATMOSPHERES. Environ. Sci. Technol., 2(6):435-437, June 1968. 17 refs.

A versatile chemical actinometer, suitable for field as well as laboratory studies, has been developed for the measurement of radiation intensities in the near-ultraviolet region. The actinometer is a thin film of poly(methyl methacrylate) in which the actinic material, o-nitrobenzaldehyde, is dispersed. On absorption of light in the 2800 to 4100 A. region o-nitrobenzaldehyde photoisomerizes to o-nitrobenzoic acid with a quantum efficiency of 0.50. The extent of this reaction upon irradiation can be related to the intensity of the radiation source. This actinometer is suitable for measuring solar radiation intensities within the region 3000 to 4100 A., the photochemically reactive wavelength region for the production of photochemical smog. (Author's Abstract) ##

12887

Ludwig, C. B., R. Bartle, and M. Griggs

STUDY OF AIR POLLUTANT DETECTION BY REMOTE SENSORS. General Dynamics Corp., San Diego, Calif., (122)p., July 1969. 124 refs.

The feasibility of detecting the major air pollutants by earth-oriented, satellite-borne sensors is investigated. The major pollutants considered are carbon monoxide, sulfur dioxide, ozone, ammonia, nitrogen dioxide, typical hydrocarbons, and peroxyacetyl nitrate (PAN). The spectral region considered extends from the ultraviolet to the microwave region. Considerations of the number of species accessible to optical detection, the matter of day and night detection, and of specificity indicate that the infrared region extending from 3.5 microns to 13 microns is the most useful one. A discussion of the pollutant species, their occurrence, formation, chemistry, concentration levels, and distribution profiles through the atmosphere is given. The problems of detection in the UV and visible regions, in relation to aerosol and molecular scattering, are discussed. Calculations of signal changes expected for an ideal Rayleigh atmosphere are presented. Some considerations of aerosol (particulate) pollution detection are discussed. Then, the radiative transfer of the thermal emission of the earth and atmosphere under the influence of meteorological conditions is investigated. Signal changes arising from the difference in radiation levels due to clean and polluted atmospheres are calculated and found to be usually more than 1%. A performance evaluation of eight different spectroscopic instruments for the remote detection of pollutants is made. These include radiometers, grating spectrometers, Fourier-transform interferometer-spectrometers, three instruments based on optical correlation methods, microwave radiometers, and one active system--a satellite-based laser. Two instruments, which are based on optical correlation methods (matched filter and selective chopper), have the greatest potential for near-future application. (Authors' abstract modified)

13039

Bamesberger, W.L. and D.F. Adams

IMPROVEMENTS IN THE COLLECTION OF HYDROGEN SULFIDE IN CADMIUM HYDROXIDE SUSPENSION. Environ. Sci. Technol., 3(3):258-261, March 1969. 11 refs.

The technique of collecting hydrogen sulfide at ambient air concentrations in cadmium hydroxide suspension, in use for more than 10 years, is reported to prevent loss from sulfide oxidation. A comparison was made of this procedure with bromine microcoulometric titration and with calculations of the anticipated hydrogen sulfide concentrations produced in a laboratory gas dilution system. An unpredictable and non-reproducible loss of hydrogen sulfide, as high as 80% during collection of a 2-hr impinger sample containing cadmium hydroxide suspension, occurred. Evidence of the photodecomposition of

cadmium sulfide in the impinger and techniques to reduce loss of sulfide during sampling and storage are presented. The suggested modification provides reproducible hydrogen sulfide recoveries. Reliable quantitative results were obtained. (Author abstract modified)

13087

Gupta, S. K. and P. K. Bandyopadhyay

NITROUS GASES-A HAZARD IN MINES AND INDUSTRIES. J. Mines Metals Fuels, 17(2):50-52, Feb. 1969. 8 refs.

The highly toxic nature of nitrogen oxides demands periodic checks on the gases in working places where they are likely to occur. Underground mines, defense installations, and many chemical factories and industrial shops are important sources of nitrous fumes. Oxides of nitrogen are produced in mines by shot firing and diesel engines. Incomplete detonation or burning of nitroglycerine explosives may produce N oxides in considerable quantities. Explosives with improper oxygen balance can produce these gases on detonation. The exhaust gases from diesel engines contain NO2, N2O4, and NO in addition to CO, SO2, and SO3. Concentrations of N oxides and CO must be lower than 1000 and 2000 ppm, respectively, in exhaust gas emissions for underground vehicles. Attention should be given to the acidic nature and solubility of N oxides in collecting gas samples. Samples collected in moist or soft glass bottles by air displacement are seldom representative. Two practical pieces of gas-sampling equipment are described. A widely used test to detect the presence of N oxides employs starch-iodide papers which turn blue on exposure to nitrous fumes. Sulfur oxides interfere with this test, as they too liberate iodine from potassium iodide. Three colorimetric methods of N oxide determination are reviewed. Recommended first aid measures for people suspected of inhaling nitrous fumes are listed.

13153

Wisse, J. A. and A. J. Meerburg

OZONE OBSERVATIONS AT BASE KING BAUDOUIN IN 1965 AND 1966. Arch. Met. Geoph. Biokl., Ser. A., 18(1-2):41-54, 1969. 15 refs.

Continuous measurements of surface ozone concentration at Base King Baudouin, Antarctica were conducted in 1965 and 1966. The total amount of ozone was observed with a Dobson spectrophotometer and its vertical distribution was determined by means of the Umkehr effect and by launching 27 sondes of the Brewer-Mast type. Observations show that ozone concentrations increase at the surface south of the Antarctic coast and that this increase is also present in the upper air up to about 400 mbar. The ozone content is highest in winter and lowest in summer. These phenomena are tentatively explained as a consequence of the mean meridional circulation, the cyclonic activity, and the destruction of ozone at the surface of the Antarctic ocean.

Umkehr observations indicate that above 30 km, the ozone content at Base King Baudouin is lowest in summer. The springtime stratospheric warming in 1965 and 1966, as well as a midwinter warming in 1966, are described. The midwinter warming occurred simultaneously in all levels down to the tropopause and did not interrupt the westerly airflow in the stratosphere. The springtime accelerated warming started in the higher levels and was propagated downward, accompanied by a decrease or a reversal of wind speed.

13422

Lahmann, Erdwin and Karl-Ernst Prescher

HYDROGEN SULFIDE DETERMINATION IN AIR WITH AUTOMATIC SAMPLING. (Schwefelwasserstoff-Bestimmung in Luft mit automatischer Protenahme.) Text in German. Wasser Luft Betrieb, 12(9):529-531, Sept. 1968. 9 refs.

A simple procedure is described for H2S determination based on photometric measurement of methylene blue formed in the reaction of H2S with dimethyl-p-phenylenediamine in the presence of Fe(III) chloride. Samples of atmospheric air are passed through an alkaline cadmium hydroxide suspension which blinds the H2S present as cadmium sulfide. Its usefulness for determination of the H2S content of contaminated air can be enhanced by automatic sampling with the aid of a commercially available control device with 12 standard impingers. However, the following conditions must be met: (1) the cadmium hydroxide suspension in the impingers must be freshly prepared in order to maintain its absorption capacity for at least 24 hrs; (2) the cadmium sulfide suspension formed upon sampling must remain stable for at least 24 hrs; and (3) the volume of the air sample must be measured with sufficient accuracy. Tests designed to find out whether these requirements can be met gave positive results. In addition, tests to determine the cross-sensitivity of the H2S determination to SO2 and NO2 showed that it is not perceptibly affected by the presence of 1 mg/cum of SO2 or NO2 in the air sample. However, in the presence of these quantities of SO2 and NO2, the cadmium sulfide content of the absorption suspensions was lowered by about 20%. This effect could be leiminated by adding 5 ml of a 1.2% solution of ammonium amidosulfonate to 400 ml of the alkaline cadmium hydroxide suspension.

13463

Warmbt, Wolfgang

SULFUR DIOXIDE MEASUREMENTS WITH AN AMPEROMETRIC-IODOMETRIC RECORDING APPARATUS. (SO2-Messungen mit einer amperometrisch-jodometrischen Registrierapparatur.) Text in German. Z. Meteorol. (Berlin), 20(1-6):43-59, 1968. 30 refs.

A detailed description is given of a discontinuously recording automatic sampling device for determination of the SO2 content of atmospheric-iodometric method. The accuracy of the new

device was checked by using laboratory air with known SO2 contents as well as by making parallel measurements of atmospheric air with the West and Gaeke method. The slightly lower SO2 values measured by the new device are ascribed to its sensitivity to the O3 content of air. This effect is negligible in most applications. The paper also contains extensive statistically evaluated data of measurements of the SO2 content of air, wind speed, and wind direction made in the periods from Aug. 1965 to July 1966 at the Wahnsdorf meteorological station near Dresden.

13932

Bethell, M. D., J. T. Shaw, and A. C. Thomas

AN IMPROVED FORM OF SOLID OXIDISER FOR THE CONVERSION OF NITRIC OXIDE TO NITROGEN DIOXIDE IN A FLOW SYSTEM. Chem. Ind. (London), no. 3:91, Jan. 20, 1968. 2 refs.

The oxidizer for accurate NO measurement is prepared by immersing a quantity of glass wool in a bath containing 15 g of K2Cr2O7 and 15 g of 98% H2SO4 made up to 100 ml with distilled H2O. After soaking, the glass wool is removed and excess solution is allowed to drain off. The impregnated glass wool is dried in an air oven at 65 C until the color has changed from orange to dark red. Eighteen hours suffices for a 30 g sample. After drying, the material is placed in a constant temperature box in a water bath at 25 C for a half hour. Tests with NO concentrations up to 100 ppm and flow rates of 140 ml/min showed conversions to the dioxide in excess of 97% for at least 90 min, and above 95% for 3 hrs.

14076

Preuer, Wolfram

NEW METHODS OF CONTINUOUS TRACE ANALYSIS. (Neue Verfahren zur kontinuierlichen Spurenanalyse). Text in German. Arch. Tech. Messen, no. 396, p. 7-12, Jan. 1969. 2 refs.

A detailed description is given of two electrolytic continuous recording devices for measurement of small traces of gases present, for example, in atmospheric air. An earlier version with a liquid electrolyte was based on Nernst's concept of a concentration chain. The new version uses an organic substance as an electrolyte which has a high dielectric constant, a low electric resistivity, a low vapor pressure, is but slightly hygroscopic, and possesses a high melting point. This electrolyte is solid and is part of a monolithic, small and rugged unit. The accuracies of measurements made by these devices vary between dilutions of 10 to the minus 9th power and 0.000001, depending on the kind of gas. At present, the following gases can be determined with these accuracies: O2, O3, Cl2, NO2, NC2 plus NO, H2S, HCN, and COCl2.

14201

Hofmann, P. and P. Stern

PHOTOMETRIC DETERMINATION OF LOW OZONE CONCENTRATIONS IN WATERS. (Photometrische Bestimmung Niedriger Ozonkonzentrationen in Waessern). Text in German. Anal. Chim. Acta, 47(1):113-120, Aug. 1969. 6 refs.

A spectrophotometric method is described for the determination of ozone in water down to a 0.01 mg/l level. Ozone reacts with the manganese(II) disphosphate complex to form the manganese(III) diphosphate complex which is then reacted with o-toluidine. If ozone is swept out of the sample by a stream of gas and absorbed in manganese(II) diphosphate solution in the presence of chromium(III) as a catalyst, the method can be applied to heavily polluted waters; at the 0.52 mg/l level, the standard deviation was 3.1%. The method can be easily adapted to the determination of ozone in gases. (Author summary modified)

14213

Haentzsch, Siegfried, Frank Nietruch and Karl-Ernst Prescher

CONTINUOUS DETERMINATION OF NITROGEN DIOXIDE IN THE AIR WITH AN AUTOANALYZER. (Kontinuierliche Bestimmung von Stickstoffdioxid in Luft mit dem Autoanalyzer). Text in German. Mikrochim. Acta (Vienna), no. 3:550-556, 1969. 17 refs.

For continuous nitrogen dioxide measurement in air, a Technicon autoanalyzer was used. A sample gas flow was drawn in through a reaction zone where it was brought in contact with a Saltzman solution. After reaction with the nitrogen dioxide, the major part of the solution went to a colorimeter. The transparency of this solution was measured and recorded. The following reaction zones were used: a siphon, a vertical reaction tube of about 60 cm length and 3.2 mm inner diameter, the gas sample and reagent passed in parallel flow, as well as in counter flow, through the tube, a helical tube, and a micro frit for continuous flow of the Saltzman solution. For calibration, a continuously produced mixture of NO2 and air was used. In all types of reaction zones, reliable NO2 measurements were obtained. The measured concentrations were found to lie in the maximum allowable concentration range (present long-term maximum allowable concentration equal 1 mg/cu m). With the 60 cm tube, it was found that neither the flow velocity nor the direction of the gas sample had any influence on the measured value. An adjustment time of 2 min was required for NO2 concentrations between 0.32 and 3.2 mg/cu m. In the 20 m tube, adjustment took about 60 min at concentrations between 0.11 and 1.10 mg NO2/cu m. For the micro frit, a low-volume container must be used for the adjustment period to remain short. The detection thresholds were found to be 5 micrograms/cu m for the 20 m helical tube and 0.15 mg/cu m for the 60 cm tube. The only disadvantage of the method is the complicated calibration process.

14408

Rhine, P. E., L. D. Tubbs, and Dudley Williams

NITRIC ACID VAPOR ABOVE 19 KM IN THE EARTH'S ATMOSPHERE.
Appl. Opt., 8(7):1500-1501, July 1969. 6 refs.

Atmospheric data obtained from balloon flights by other investigators suggested that previously unreported atmospheric bands at approximately 30 km and a solar zenith angle of 90 deg were caused by the association of nitric acid vapor with the ozone layer. To estimate the amount of nitric acid vapor in the atmosphere at this altitude, atmospheric nitric acid vapor was experimentally measured in an absorption cell in the spectral regions of 1240-1380 inverse cm and 810-940 inverse cm. Laboratory and atmospheric data were compared by integrated spectral absorbance. Approximately 10% of the total absorbance in both laboratory and atmospheric spectra is associated with Q branches at the overlapping bands 879 and 897 inverse cm, and it is concluded that any observable nitric acid vapor contributions to solar absorption spectra at low altitudes would be connected with these band Q branches. Production of nitric acid vapor in the ozone layer may proceed according to the reactions H plus O3 yields O2 plus OH*, or OH plus NO2 yields HNO3. The second reaction is presumed to be enhanced by darkness.

14429

Shaw, Manny

ELECTROCHEMICAL TRANSDUCERS FOR AIR POLLUTION MONITORING.
Preprint, Am. Chem. Soc., Pittsburgh, Pa., Div. Water, Air, Waste Chem., 4p., 1969. (Presented at the Am. Chem. Soc., 158th Natl. Meet., Div. Water, Air, Waste Chem., New York, 1969.)

Electrochemical transducers that permit the monitoring of SO2, NO, and NO2 in the presence of hydrocarbons, CO, CO2, ozone, oxygen, nitrogen, and water are described. By the proper selection of electrolyte, membrane, sensing electrode catalyst, counterelectrode, or potentiostatic control, electrochemical sensors can be made selective to SO2 in the presence of NOx and vice versa, as well as selective to NO2 in the presence of SO2 or NO. Full-scale sensitivities range from 0 to 2, or 0 to 1000 or 5000 ppm. Minimum detectability at present is 0.04 ppm. Response times of 10 seconds to 90% of steady-state value have been obtained. Present sensors are compensated to permit operation with samples varying from 40-100 F. The technology of the electrochemical transducer is described. It is a sealed unit, easily integrated as a component part of the monitor, the remaining components being electronic in nature. Operation of the monitor is simple, involving adjustment of only three control knobs. The use of the electrochemical transducer-type of monitor for the continuous analysis of nitrogen oxides in vehicle exhaust emissions is briefly noted, as well as its possible application for monitoring SO2 in certain industrial emissions. (Author introduction modified)

14486

Ohi, K.

THE DETERMINATION OF ACIDIC GASES IN WORKING ENVIRONMENTS BY ALKALI FILTER PAPER. (Alkali roshi ho ni yoru sagyo kankyo chu sansei gas no sokutei). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 24(1):49, April 1969.

The alkali filter paper method for determining acid gases in working environments entails soaking filter paper in a 30% potassium carbonate solution, drying the paper in air, and putting it in a vinyl holder having an exposure area of 64 sq cm. Absorbed gases are extracted with distilled water and determined qualitatively and quantitatively. The required exposure time is determined by the type of acid being measured, the production process, and the sensitivity of the determination method. Generally, 1 to 8 hrs are appropriate for acidic gases like SO2, HCl, and NO2, and 8 to 24 hrs for acid mists of sulfuric, phosphoric, and chromic acids. One hour is usually required for SO2 measurements by the para-rosaniline formaline method; the CL-Ba method requires 8 to 24 hrs. When the relationship between the amount of SO2 adsorbed on the filter paper and the average gas concentration in the working environment is plotted, a curve is obtained. Thus, on a per day basis, the coefficient of conversion depends on the amount adsorbed. However, the graph for an hour of exposure time is linear, suggesting that shorter exposure times would be convenient for the calculation.

14502

Her Majesty's Factory Inspectorate, Dept. of Employment and Productivity

METHODS FOR THE DETECTION OF TOXIC SUBSTANCES IN AIR. OZONE IN THE PRESENCE OF NITROUS FUMES. London, Her Majesty's Stationery Office, Booklet 18, 1969, 10p. 4 refs.

The occurrence, toxic effects, and detection of ozone are reported. Ozone is present in very small quantities in the atmosphere, and following and during electrical storms, it may reach sufficiently high concentrations to be recognizable by odor. It is used for water sterilization, bleaching of oils, paper, and flour, and combating odors in place of proper ventilation. Ozone is formed industrially during high-tension, non-sparking discharge in air or oxygen, during electrical etching of polyethylene film, and during electric arc welding using an inert gas cover. Toxic effects include headache or respiratory irritation at low concentrations, and pulmonary edema and inflammation of the lung which are delayed and are found at concentrations as low as 1 ppm. The method for detection of ozone is based on the ability of cotton wool to remove ozone quantitatively from an atmosphere without affecting its nitrogen dioxide content. The analysis of an atmosphere both with and without passage through a cotton wool plug will give a measure of the ozone concentration present. A starch-iodine

colorimetric procedure is employed for quantitative estimation by comparison with glass color standards.

14550

Hersch, Paul A.

GALVANIC AIR POLLUTION MONITORING, AIDED BY CATALYSIS. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 359-362. 3 refs.

Several galvanic systems that can serve as simple, sensitive, and selective analyzers for continuous air pollution monitoring operations are briefly described. One such system involves combining a partly gas-exposed cathode with a stagnant alkaline electrolyte and a base metal anode; in other systems, the electrolyte may in some cases be advantageously recirculated, using the sample air stream for lifting the liquid. Cells have been developed for monitoring carbon monoxide, nitric oxide, ozone, and sulfur dioxide. Thus, all the major pollutants except hydrocarbons can now be monitored by galvanic systems; sensors for aldehydes and olefins are likely to follow. The cells avoid pumping liquid reagents into the analyzer and disposing of spent reagent. They also avoid the temperature dependence and inherent instability of membrane-covered 'polarographic' sensing devices. Without a membrane barrier, a major portion and sometimes all of the sampled, electromotively-active species reaches the electrode. The importance of the relation between galvanic air pollution sensors and catalysis is discussed. The pollutant may enter a catalytic reaction, depending on the electrode it contacts, or it may itself act as a catalyst. Catalysis is involved in calibration procedures and may help in making an analyzer more specific. Catalysts also have an important place in precursor-reactors which convert an analytically intractable constituent to one that is more readily amenable to determination.

14607

Skala, H., F. G. Padrta, and P. C. Samson

DIESEL ENGINE POLLUTANTS. PART I. IDENTIFICATION. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 209-220.

High molecular weight organic constituents of diesel exhaust other than unburned diesel fuel were identified. Samples were collected by the use of a thermal gradient trap from a slip stream off the total exhaust effluent. The organic pollutants were partitioned out with n-hexane. A portion of the diesel

odor concentrate was subjected to additional separation over silica gel. Identification of the components was made by mass spectrometry. The pollutants were found to be partially oxidized components of the diesel fuel over its full molecular weight range. Five different classes of oxygenated hydrocarbons were found: aldehydes and ketones, carboxylic acids, alcohols, phenols, and nitrophenols. These yielded a total of over 400 observable species. Aldehydes and ketone derivatives of paraffins, cycloparaffins, olefins, and aromatics were observed. In the aromatic series, benzaldehyde, indanone, cinnamaldehyde, indenone, naphthaldehyde, acenaphthenone, and fluorenone and their higher homologues were found. The aromatic carbonyl compounds were the predominant species. The vital role of the aromatic oxygenates in the diesel odor picture was further substantiated by the absence of diesel odor in the exhaust when a fuel consisting of only n-paraffins was used. The precursors of diesel odor are therefore considered to be primarily the aromatics present in diesel fuel. Their observed relative enrichment is reasonable when one considers the relative rates for oxidation of a paraffin versus an aromatic. For aromatics, oxidation to intermediate compounds is faster than for paraffins, and complete oxidation is slower.

14705

Spurny, K.

PHYSICS AND CHEMISTRY OF ATMOSPHERIC EMISSIONS AND IMISSIONS. (Fyzika a chemie atmosferickych emisi a imisi). Text in Czech. Ochrana Ovzdusi, no. 2:22-25, 1969. 16 refs.

This review of the physics and chemistry of air pollution attempts to define important branches in the field of atmospheric conservation, e.g., aerosol physics and chemistry, photochemistry of air pollution, and chemical analysis of air pollutants. Problems relating to applied physics and chemistry are discussed, and important methods of evaluating air pollution problems are summarized. In the field of physics, the importance of atmospheric dispersion models for the study of atmospheric aerosols is stressed. In the chemistry of air pollution, particular attention is given to analytical and measurement methods for studying the chemical reaction of pollutants and smog formation. (Author abstract modified)

14817

Abel, Nikolaus, Peter Winkler, and Christian Junge

STUDIES OF SIZE DISTRIBUTIONS AND GROWTH WITH HUMIDITY OF NATURAL AEROSOL PARTICLES. PART I. A SENSITIVE LARGE-ION COUNTER FOR STUDYING SIZE DISTRIBUTIONS OF ATMOSPHERIC AEROSOL PARTICLES WITH RADII SMALLER THAN 0.1 MICRON. Max-Plank-Institut fuer Chemie, Mainz, West Germany, Otto-Hahn-Institut, Contract AF 61 (052)-965, AFCRL-69-0205, p. 1-40, Jan. 1969. 17 refs.
AD 689189

A sensitive large-ion counter was improved and tested under field conditions. The instrument and measurements were made at Schauinsland, Germany, the Bay of Biscay, and on Tenerife, Canary Islands, areas of relatively clean air. The result was a large-ion counter which can determine atmospheric aerosol size distributions over the particle size range of 0.000001 cm to 0.00001 cm radius, at particle number concentrations down to about 500/cu cm. In this lower concentration range, the operation of the instrument is rather laborious and the accuracy of the results still unsatisfactory, depending to a large extent on the presence or absence of different environmental perturbations, the influence of which was investigated. The sensitivity that was reached cannot be improved very much with the presently available technique. In order to obtain reliable information on the size distribution of tropospheric background aerosols, the sensitivity has to be improved by at least a factor of 5 and the range has to be extended down to 10 to the minus seventh power cm radius. Ion mobility measurements are not capable of meeting these requirements for basic and technological reasons. (Author conclusions modified)

14831

Regener, Victor H. and Luis Aldaz

STUDIES OF ATMOSPHERIC OZONE. New Mexico Univ., Albuquerque, Dept. of Physics and Astronomy, Contract AF 19(628)-5934, Proj. 8631, Task 863102, Work Unit 86310201, AFCRL-69-0138, 171p., March 15, 1969. 22 refs.
AD 689,813

This report contains three papers on studies of atmospheric ozone. In 'Turbulent Transport Near the Ground as Determined from Measurements of the Ozone Flux and the Ozone Gradient', simultaneous measurements of the vertical fluxes of ozone and heat were made, together with measurements of the vertical profiles of ozone and temperature in the first 16 m above the surface. The eddy flux of ozone was determined by a new method using the decay of ozone in a box with open bottom, placed on the ground. The results showed that measurements of the ozone flux and ozone gradient can be used for determinations of the eddy transport of atmospheric properties in low-wind situations, whenever measurements of temperature or wind profiles and of the related fluxes are not practical. In 'Flux Measurements of Atmospheric Ozone Over Land and Water', it was determined that the downward flux of ozone over New Mexico soil averages 3 times 10 to the 11th power molecules/sq cm-sec, and over the Atlantic Ocean 0.2 times 10 to the 11th power molecules/sq cm-sec. Estimates for the global ozone sink range from 5.4-8.6 times 10 to the 29th power ozone molecules/sec. In 'Folded Optical Path of Great Length From Multiple Reflections Between Two Corner Cube Reflectors', the design of a simple multiple-path absorption chamber is presented, in which the light path travels back and forth between two corner cube reflectors. As a result of the exact beam reversal, which is automatically provided by these reflectors, precise optical alignment is unnecessary. Selection of a desired number of

transversals is accomplished by means of suitably placed aperture stops. The light paths do not cross over each other anywhere. The report also contains 205 computer-plotted graphs showing profiles of ozone, temperature, and wind in the first 16 m above the surface. (Author abstract modified)

14837

Forverg, Walter and Hans-Joachim Crecelius

DETERMINATION OF NITROUS OXIDE IN ATMOSPHERIC AIR. Staub (English translation from German of: Staub, Reinhaltung Luft), 28(12):16-19, Dec. 1968. 5 refs.

The determination of nitrous oxide content in air was investigated. Determination is facilitated when two separate gas flows are studied, into one of which an oxidation agent is introduced to effect oxidation of NO to NO2. The difference between the two resulting NO2-concentrations gives the NO-concentration. The degree of oxidation is 97% in a concentration range between 0.2 and 0.5 ppm NO. The moisture content of the test gas was reduced by phosphoric acid, so that an oxidizing mass stability of several weeks was reached. Since the degree of oxidation depends on oxidant layer thickness and on rate of flow, the retention time was measured in order to determine the optimum layer thickness and flow rate. The maximum allowable retention time in the oxidant was 0.8-1.0 seconds. No linear dependence in the range from 5-50 1/hr could be established. The temperature range for favorable oxidation lies between 0-30 C. In the range between 0.2-0.5 ppm NO in air, no dependence of the degree of oxidation on concentration could be established. For a steady concentration of 0.1 ppm NO2 and about 0.1 ppm SO2, no change in the degree of oxidation could be detected in industrial air contaminated with organic substances, ammonia and dust after 4 weeks and a throughput of 50 cu m of air. The standard deviation of the determination is about 5.5% rel., for 1 mg NO/cu m; the determination limit is 0.4 micrograms NO.

14992

Shaw, John H., Dale Ford, Donald Snider, and Robert Mitchell

RESEARCH DIRECTED TOWARD DETERMINATION OF RADIOACTIVE PROPERTIES AND COMPOSITION OF THE ATMOSPHERE. (Final Report.). Ohio State Univ. Research Foundation, Columbus, Contract F19628-67-C0216, Proj. 7670-03-01, Task 767003, AFCRL-69-0062, 70p., Dec. 16, 1968. 13 refs.
AD 685097

Progress in the construction of a Fabry-Perot interferometer to use in increasing the resolving power of the 2.0 m Ebert-type spectrometer in the region of 4 to 6 microns is described, including the optical alignment procedures used and the control system design. A 21-m long, 76-cm diameter stainless steel

multiple traversal absorption cell was constructed and its performance is described. Preliminary measurements of the abundance of ground level CO in laboratory air were made by using the line R of the fundamental vibration band; they indicate that this method of air sampling is accurage, unambiguous, and rapid. Two related papers are included as appendices: one presents measurements of the strengths of the N2O bands near 4.5 microns; the other discusses the infrared spectrum of ozone. (Author abstract modified)

15171

Yamate, Noburu

MANUAL METHODS AND AUTOMATIC CONTINUOUS INSTRUMENTS FOR MEASUREMENT OF GASEOUS AIR POLLUTANTS. (Gasujo taiki osenshitsu no sokutei to sono sokuteikiki). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(10):785-796, Oct. 1969. 36 refs.

In order to prevent air pollution, measurement of pollutant concentrations must be continuously performed. In this report, both continuous monitoring and manual analyses of typical air pollutants are revieved. Numerous methods are tabulated and most of them are explained, with particular attention to continuous methods and apparatus. Sulfides are measured manually by colorimetric analysis with rosaniline or barium molybdate, by the lead per oxide method, or by test paper methods. Sulfides are also measured continuously by means of solution conductance (Thomas autometer) or by optical absorption with rosaniline or with iodine-starch. Carbon monoxide is measured manually with palladium sulfate and ammonium molybdate, by gas chromatography, or by the hopcalite method. It is measured continuously by infrared or ultraviolet absorption of reduced mercuric oxide. Nitrides are measured manually by the Saltzman or the Jacobs method, or with ortho-tolidine sulfate. Hydrogen sulfide is measured manually by methylene blue and continuously by a colorimetric filter paper method. Hydrocarbons are measured manually by gas chromatography and continuously by flame ionization detectors. Formaldehyde is measured manually by colorimetric analysis with a chromotropic acid or with acetylacetone, or by the MBTH method. Ozone is measured manually by the phenolphthalein or the potassium iodide method and continuously by coulometric titration or by optical absorption with potassium iodide. Fluorides are measured manually by colorimetric analysis with thorium neothron(?) or lanthanum alizarin complex and continuously by filter paper fluorescence. Actual Tokyo data on changes in the concentrations of carbon monoxide, nitric oxide, and nitrogen dioxide are tabulated.

15200

King, W. H., Jr.

THE CONTINUOUS MEASUREMENT OF HYDROGEN, METHANE, AND HYDROCARBONS IN THE ATMOSPHERE. Preprint, American Chemical Society,

Washington, D. C., 20p., 1969. 3 refs. Presented at the American Chemical Society, 158th National Meeting, New York, Sept. 8-12, 1969.

Photochemically inert methane accounts for 90% of atmospheric hydrocarbons, and its large signal interferes with the flame ionization detection of active smog-producing hydrocarbons. To overcome this problem in hydrocarbon monitoring, automatic systems were developed which use a flame ionization detector or water sorption detector in conjunction with a selective catalytic combustor. The programmed combustor unit, consisting of a quartz tube containing a platinum wire coil, takes advantage of methane's inertness to analyze for it in the presence of hydrocarbons. The combustor can be utilized in three ways, each of which was evaluated for several months in the laboratory and in the field. One method involves the selective combustor and a flame ionization detector. An automatic zero level, methane, and total hydrocarbons are recorded by this method. In the second method, hydrocarbons are dried, combusted, and converted to water and carbon dioxide. The water is detected by a sorption detector. Hydrogen, olefins, paraffins, and methane are recorded. The third method is analogous to the second, except that carbon dioxide is determined, rather than water. The second method is preferred since no extra gases are required, calibration is simple, and equipment is portable and battery-operated. With this technique, 1.6 ppm methane, 1.5 ppm paraffins, and 1.9 ppm olefins and other reactive hydrocarbons have been recorded. However, it is expected that air monitoring stations with flame units will prefer the first method. The water sorption technique should gain acceptance if hydrocarbon monitoring becomes important.

15210

Purcell, R. F., R. R. Bennett, and J. T. Allen

A TEST FOR STABILITY OF SOLVENTS TO ULTRAVICLET RADIATION. Am. Chem. Soc., Div. Org. Coatings Plastics Chem., Preprints, 29(2): 441-444, 1969. (Presented at the Am. Chem. Soc., 158th Meeting, New York, Sept. 1969.)

A simple screening test was devised to determine the stability of solvent vapors tc ultraviolet radiation in the presence of NO2. Stability is measured by following the disappearance of the solvent as shown by gas chromatograms taken at various time intervals. Multiple runs were made on most of the solvents and excellent reproducibility was obtained. The test results indicated considerable variation in the stability of various solvents under these static conditions. The test is a simple and inexpensive method for measuring solvent stability to ultraviolet radiation. If an equally simple test for eye irritants can be found utilizing irradiated samples from this method, a useful test for screening smog-producing potential will be possible.

15234

Duardo, J. A.

STUDY TO DEVELOP A TECHNIQUE FOR MEASUREMENT OF HIGH ALTITUDE OZONE PARAMETERS. Electro-Optical Systems, Inc., Pasadena, Calif., Contract NAS12-137, EOS Rept. 7087, 217p., Nov. 12, 1968. 190 refs.
CFSTI: N69-19889

Results are presented of a two year study and research effort to evaluate optical techniques for the continuous monitoring of worldwide atmospheric ozone distributions. Laser techniques for remote probing of the atmosphere for ozone are analyzed, and recommendations are made for further study of one specific technique involving ground-based lasers. The report emphasizes the practicality of a passive technique for monitoring ozone from satellites, which relies on the use of the sun as a light source for absorption measurements through the earth's atmosphere. Because of the high sensitivity of the photoelectric detectors used and the high irradiance values of the sunlight in the middle atmosphere, signal-to-noise ratios between 1000 and 10,000 could be achieved by this detector system while maintaining the requisite high spatial and spectral resolutions. The vehicle chosen for the proposed measurement system is the Nimbus meteorological satellite, whose near polar, sun-synchronous orbits would allow excellent coverage of the ozone distributions at high latitudes in both hemispheres. The importance of this type of coverage, from the viewpoint of understanding complex polar atmospheric circulation patterns, is also treated in detail. (Author abstract modified)

15301

Liddell, H. F.

A REAGENT FOR SULPHUR DIOXIDE. Analyst, vol. 80:901, Dec. 1955. 5 refs.

The author describes the discovery of a sensitive reagent for the detection of small quantities of sulfur dioxide in smog to be used on filter paper in conjunction with a suitable pump for sampling. The bleaching effect of sulfur dioxide on dyestuffs was investigated and Astrazone Pink FG (Bayer) was found to be satisfactory as a reagent. A drop of reagent is placed on the filter paper; some of the reagent will spread beyond the hole and furnish a background of unchanged color against which the bleaching effect may be observed. Air is then drawn through the wet paper at a rate of 250 ml/min until the bleaching takes place and the volume of air required to produce this effect is noted. A concentration of 1.5 micrograms of sulfur dioxide in 500 ml of air will give a definite reaction.

15334

Knipovich, O. M. and Yu. M. Emel'yanov

CONTINUOUS DETERMINATION OF OZONE CONCENTRATION IN GAS MIXTURES BY MEANS OF ITS HEAT OF DISSOCIATION. (Nepreryvnoye opredeleniye Kontsentratsii ozona v gazovykh smesyakh po teplote yego razlozheniya). Text in Russian. Zavodsk. Lab. (Moscow), 35(8):964-965, 1969.

An analyzer was designed for continuous measurement of ozone in gas mixtures. Ozone dissociation is an exothermic process and the heat in the catalyzer is continuously recorded by means of a potentiometer. A sulfuric acid manometer was used to measure pressure drop. It was claimed that the unit operates effectively for up to two months. (Author abstract modified)

15354

Wilson, K. W., G. J. Doyle, D. A. Hansen, and R. D. Englert

PHOTOCHEMICAL REACTIVITY OF TRICHLOROETHYLENE AND OTHER SOLVENTS. Am. Chem. Soc. Div. Org. Coatings Plastics Chem. Preprints, 29(2):445-449, 1969. 6 refs. (Presented at the 158th Meeting of the Am. Chem. Soc., Div. Organic Coatings and Plastics Chemistry, New York, Sept. 1969.)

A special smog chamber was built to study the slowly reacting solvents which, in the presence of nitrogen oxides, form smog much more slowly than do automobile exhausts. The chamber has Pyrex panels with an access wall of cast aluminum. The aluminum wall incorporates eye ports for measurement of eye irritation, an access hole for the optics of a miltireflection infrared cell, and sampling ports through which gas is removed for wet chemical analysis. An air purification system for the chamber removes contaminants by catalytic combustion over platinum at 5-8 atm and 500 to 600 C and cools the purified air to below 327 C and about 1 atm. Performance of the chamber was validated by charging it with test hydrocarbons, e.g., ethylene, cyclohexane, tricholoroethylene, xylenes, and paraffins at 1, 4, or 8 ppm and nitric oxide at 0.25, 1, or 2 ppm. The photooxidation experiments show that the rate of photochemical smog formation decreases as the hydrocarbon:nitric oxide ratio decreases and that eye irritation is caused primarily by formaldehyde. As judged by its rate of disappearance, trichloroethylene is less reactive than ethylene. Trends observed with changing concentrations of trichloroethylene also suggest that average atmospheric concentrations of trichloroethylene would produce no eye irritation or other measurable smog symptoms.

15476

Zuev, V. E., M. V. Kabanov, and B. A. Savel'ev

THE LIMITS OF APPLICABILITY OF THE BOUGUER LAW IN SCATTERING MEDIA FOR COLLIMATED LIGHT BEAMS. Bull. Acad. Sci. USSR, Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 3(7):414-418, July 1967. 17 refs.

According to existing theoretical investigations, the attenuation of direct, monochromatic radiation is described by Bouguer's law, whose limits of applicability are determined by the strength of the forward-scattered radiation. In the present investigation, the limits of the application of the law were experimentally determined for the propagation of a narrow collimated beam in different scattering media. Results, covering a range of optical depths, are given for thermal sources and lasers. Direct ray scheme measurements for wood smokes in a cloud chamber show no divergence from the exponential law over the range of optical depths. The law is applicable at depths up to tau equals 12. A limit to the law's applicability was found when measurements were made on the reflected scheme. This occurs at tau equals 23. The principal difference between the reflecting and direct ray schemes lies in the fact that, in addition to forward-scattered radiation, the receiving system records back-scattered radiation from the beam travelling from the collimator to the mirror. Measurements using the reflecting scheme show the limit of applicability is the same for water fogs and wood smokes. This means that the brightness of the back-scattered light does not depend on the optical properties of the scattering medium at these optical depths. Applicability of the law in a model medium is restricted to comparatively small ranges of optical depths.

15484

Lang, Helen W., W. E. O'Neill, E. A. Coulehan, and R. W. Freedman

CONTINUOUS MONITORING OF DIESEL EXHAUST GAS FOR CARBON DIOXIDE, CARBON MONOXIDE, OXYGEN, METHANE, AND NITROGEN OXIDES. Bureau of Mines, Washington, D. C., RI 7241, 14p., March 1969. 9 refs.
CFSTI: PB 183386

A monitoring system was applied to provide rapid, continuous analyses of diesel exhaust gas. Commercially available continuous analyzers with strip chart readout were employed for nitric oxide, carbon dioxide, methane, carbon monoxide, and oxygen. All five continuous analyzers performed satisfactorily during the preliminary testing and were used successfully during several actual diesel approval tests. The results were checked by two independent analytical methods: gas volumetric and gas chromatographic analyses. It was shown that the use of nondispersive infrared analyzers is a generally accepted technique for on-stream analysis of carbon dioxide, carbon

monoxide, and methane gases. Polarographic analyzers worked well for on-stream analysis of oxygen. Mass spectrometry was used to determine the nitric oxide content. Strip chart recorders provided permanent records of all concentration changes during the course of the approval tests. It was believed that the use of analyzers would speed up the diesel approval testing procedure.

15521

Nietruch, Frank and Karl-Ernst Prescher

DILUTION SYSTEM FOR LOW CONCENTRATIONS OF NITROGEN DIOXIDE AND DETERMINATION OF THE SALTZMAN FACTOR. (Dosierung kleiner Stickstoffdioxid-Mengen und Bestimmung des 'Saltzman-Faktors'). Text in German. Z. Anal. Chem., vol. 244:294-302, 1969. 40 refs.

A dynamic flow system is described by which dinitrogen tetroxide (N_2O_4) is diluted with air in two steps to obtain NO_2 concentrations in the ppm range. Through thermostatization of the first stage, the dissociation of the dinitrogen tetroxide could be taken into account during calculation of the NO_2 end concentration. With the NO_2/air mixture obtained by this method, the Saltzman photometric analysis of NO_2, which is based on the formation of an intensely colored azo dye was tested. The results obtained with gaseous NO_2 and with equivalent amounts of aqueous nitrite solution are compared. At a concentration of 1.5 micrograms NO_2 per 25 ml absorbing solution, the dye formation by 1 mole NO_2 equals that of 1 mole of nitrite ('Saltzman-factor' 1.0). If the concentration is 10 micrograms/25 ml, the intensity of the color effect due to 1 mole of NO_2 equals 0.86 moles of nitrite ('Saltzman-factor' 0.86). Only half the expected color intensity was found when a NO_2/air mixture was used that had been prepared by a dynamic two-step dilution and oxidation of NO ('Saltzman-factor' 0.5).

15621

Terabe, Motoji

DETERMINATION OF OXIDANTS IN THE ATMOSPHERE. (Taiki chu no oxidant (ozone o fukumu) no sokuteiho. Kagaku bunsekiho o chushin to shite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(6):333-339, June 15, 1968. 8 refs.

Three elementary methods for the chemical analysis of oxidants in the air are described in detail and compared: the buffered-potassium iodide method, the alkaline potassium iodide method, and the phenolphthalein method. Air is passed through the solution containing potassium iodide, and the isolated iodide is measured. The neutral buffered-potassium iodide method can measure an oxidant from several ppbm to about 10% and is easier to use and more accurate than the alkaline potassium iodide method. The absorbing solution consists of 0.1 M sodium phosphate and 0.1 M potassium phosphate containing 1% potassium iodide. The optical

absorption of the isolated iodide is measured a half an hour to one hour after sampling using a 352 millimicron light. Iodide is isolated by chlorine, hydrogen, peroxide, ozone, and so forth. The alkaline potassium iodide method can measure an oxidant from 2.3 pphm to about 20 ppm. The merit of this method is that it allows analysis a long time after sampling. The absorbing solution is 1 N sodium hydroxide containing 1% potassium iodide. The solution can be stored for several days. To isolate the iodide a phosphoric acid-sulfamic acid reagent is added. The phenolphthalein method can measure 0.01 to 0.25 ppm ozone when 10 liters of air are used. By regulating the air sample, a wider range of concentration can be covered. Analytical methods for oxidant determination used in the U.S.A. are also explained. Measured values of oxidants in the U.S.A. are tabulated, particularly those in Los Angeles.

15634

Grasley, M. H., B. R. Appel, I. G. Burstain, J. L. Laity, and H. F. Richards

THE RELATIONSHIP OF SMOG CHAMBER METHODOLOGY TO HYDROCARBON REACTIVITY IN POLLUTED AIR. Am. Chem. Soc. Div. Org. Coatings Plastics Chem. Preprints, 29(2):422-426, 1969. 4 refs. (Presented at the 158th Meeting of the Am. Chem. Soc., Div. Organic Coatings and Plastics Chemistry, New York, Sept. 1969.)

The influence of relative humidity on the smog-producing properties of 1.0 ppm toluene and 0.5 ppm NO in ultrapure air was observed in a stainless steel smog chamber in which the only variable parameter was the method of cleaning the chamber. The half-life of toluene decreased from 265 min at 0% relative humidity to 65 min at 43%. Similarly, the rate of conversion of NO to NO2 increased with higher humidity. Striking accelerations of the rates of NO2 and ozone formation and hydrocarbon disappearance were noted when the chamber was evacuated and heated overnight prior to irradiation. With evacuation as the only cleaning step, NO2 formation for 1.5 ppm toluene and 0.6 ppm NO at 21% humidity was 6.9 ppb/min. With cleaning by evacuation and heating, the rate was 11.0 ppb/min. When the chamber was dosed with 1 ppm of NO2, NO2 formation rose to 15-20 ppb/min. Consistently low formation rates were obtained when the chamber was washed with trichloroethylene and water. This cleaning method, followed by NO2 conditioning, is recommended to maintain reproducible chamber behavior. The humidity phenomenon was also observed with 2.0 ppm toluene and 1.0 ppm NO in a Pyrex [illegible]k; NO2 formation doubled in going from 0 to 60% humidity. The disappearance of toluene and the formation of ozone was also accelerated by high humidity. It is concluded that when a scale of hydrocarbon reactivities is being developed for polluted air, the humidity must be known and held constant throughout a given series of experiments.

15752

Hatterer, Andre and Michel Forissier

PSEUDOCHROMATOGRAPHIC MICROANALYSIS UTILIZING GAS-SOLID EQUILIBRIA. DETERMINATION OF NO2, NOCl, Cl2, HCl, CO2 AND H2O. (Microanalyse pseudochromatographique utilisant les equilibres gaz-solide. Dosage de NO2, NOCl, Cl2, HCl, CO2, H2O). Text in French. Z. Anal. Chem., vol. 247:266-271, Oct. 1969. 12 refs.

Gas separation was carried out in two stages, condensation and sublimation, in a small metal tube exposed to a temperature gradient from 77 to 300 K. A non-condensable gas such as helium, hydrogen or nitrogen was used as a carrier. In the first stage, the components of the mixture were selectively solidified in the cooled tube under partial pressures below those of the triple points. In the second stage, heating of the tube with an inverted temperature gradient caused sublimation and completes the separation. Catharometers or mass spectrometers were employed for the detection and determination of the gases. Gases could be determined in the range of 0.000001 to 0.0001 mole/ml of gas. (Author abstract modified)

16016

Marsh, K. J.

THE MEASUREMENT OF AIR POLLUTATION AROUND OIL REFINERIES. British Petroleum Co., Middlesex, England, Rept. of the Working Group 'Stack Height and Atmospheric Dispersion', Concawe, The Hague, Netherlands, 15p., Jan. 1968. 13 refs.

Principles of air pollution measurements are summarized to guide oil refineries in planning emission measurements and analyzing emission data. Pollutants considered are sulfur dioxide, hydrogen sulfide, mercaptans, smoke, solids such as grit and acid smuts, nitrogen oxides, hydrocarbons, ozone, and other oxidants. The advantages of using new commercial instruments for continous or consecutive measurements at fixed sites are contrasted with discontinuous methods using discrete samples. To determine the long-term pollution pattern around a refinery, data must be accumulated for a number of years and cumulative frequency curves derived for various concentrations of a pollutant at each measuring point. Such a curve can be used to determine the 'dosage' at each point and the damage caused by pollution. The effect of wind direction on pollution measurements must also be determined. To do this, measurements at each point are grouped according to the principle wind directions, a cumulative frequency curve is derived for each group, and concentrations obtained from the curve are plotted on vector diagrams similar to wind roses. These vector diagrams will tell whether changes in frequency distribution of pollutants are due to refinery operations or variations in weather.

16022

Ireland, F. E.

AIR POLLUTION IN TEHRAN: COMMISSIONING OF AIR MONITORING APPARATUS AND ADVICE ON DEVELOPMENT OF AN AIR POLLUTION CONTROL PROGRAMME 18 OCTOBER - 6 NOVEMBER 1966. World Health Organization, Geneva, Switzerland, Regional Office for the Eastern Mediterranean, Assignment Report, EM/ES/94, Iran 45/Regular, 15p., Jan. 1967.

This report deals with the purchase of equipment for monitoring concentrations of smoke and sulfur dioxide, total oxidants, carbon monoxide, and nitrogen oxides in Tehran. It is hoped that evidence of pollution obtained by daily monitoring will convince health authorities of the need to establish air pollution control programs. Industrial sources of pollution in Tehran are represented by plastic works, brickworks, and cement factories. Recommendations are presented for controlling emissions from these sources. Data on power plants and their fuel consumption and general fuel consumption are tabulated. While the total mass emission is not high at present at Tehran, it may increase with increasing industrialization unless natural gas becomes available. Factors affecting dispersion are the heights of chimneys, plume rise due to buoyancy, and the hindering of dispersion by stable layers of air in the atmosphere. It is recommended that the production of smoke should not exceed Ringelman 2 and that industrial pollution sources be provided with electricity for mechanical combustion equipment. A control laboratory must be set up to analyze samples collected by the monitoring equipment, and epidemiological research at Tehran University should be linked to air pollution monitoring program.

16085

Golesworthy, R. C. and D. R. B. Ripp

A CONCICAL PROBE FOR SAMPLING IONS FROM HIGH TEMPERATURE GASES. Rocket Propulsion Establishment, Westcott, England, TM-486, 7p., Dec. 1968. 2 refs.
CFSTI: AD692057

A method is given for producing a stainless steel conical sampling probe shell with an orifice of about 0.1 mm made in a platinum insert at the cone apex. The probe preserves the composition of highly reactive gases during sampling of ions, free radicals, or atoms. The cone was used to sample flames with linear velocities of about 30 meter/sec at 1300 to 2000 C and atmospheric pressures. The maximum sampling rate permitted by pump throughput was about 0.6 std atm cu cm/sec. Estimated distortion of the flow field velocities during sampling was no more than five percent at a distance of one orifice diameter upstream of the probe. As formed by spark erosion, the internal surface of the sampling hole is rough. When in contact with flame gases under sampling flow conditions, the surface acquires a smooth

finish and long-term dimensional stability. If mounted in a heatsink, no damage to the cone occurs during four hours of contact with flame gases at 2000 C. If the flange is connected to a water-cooled face-plate, the cone will operate at temperatures below 950 C. The normal lifetime of a cone is 60-100 hours of use, after which contamination or enlargement of the orifice renders it unserviceable.

16232

HIGHER OXIDES OF NITROGEN AS AN IMPURITY IN NITROUS OXIDE. Brit. J. Anaesthesia, 39(5):343-344, May 1969.

In the field of anesthesiology, little is known about the contamination of nitrous oxide with higher nitrogen. Moreover, testing for nitric oxide presents at least three problems that are not widely understood. First, samples of contaminated nitrous oxide must be drawn from the supernatant gas (although sampling of the liquid should also be used to detect nitrogen dioxide). Secondly, the more sensitive and widely used tests detect only nitrogen dioxide. The third problem arises from oxidizing nitric oxide to nitrogen dioxide with gaseous oxygen for detection purposes. More active oxidizing agents than oxygen at atmospheric pressure are needed for quantitative determination of nitric oxide. The effects of inhaling contaminated nitrous oxide can be considered due to the formation of hydrogen (hydronium) and nitrite ions by the reaction of nitrogen dioxide with body fluids. To prevent the distribution of contaminated cylinders, manufacturers must adopt appropriate measures of purifying, monitoring, and analyzing nitrous oxide. Furthermore, the limits of impurities which may be present in cylinder gases must be specified.

16306

Johnson, M. C.

NITRIC OXIDE MEASUREMENTS IN THE FAR ULTRAVIOLET. Bendix Tech. J., 2(3):90-93, Autumn 1969. 3 refs.

Future control of air pollution from motor vehicles will require the accurate detection and control of nitric oxide emissions. The techniques most commonly used for nitrogen oxide determinations are based on infrared absorption, visible absorption, and wet chemical reactions. Infrared determinations are hampered by water vapor and carbon dioxide interference. Visible absorption and chemical reactions take too much time. The feasibility of a nitric oxide detector based on absorption at 2262 A (ultraviolet) was studied. Interferences, absorption measurements at candidate wavelengths, and sensitivities were determined. This was accomplished by passing various gases and gas mixtures through an absorption cell of known length and measuring the decrease in intensity of monochromatic light passing through the cell. Absorption measurements in the

ultraviolet had the advantage of using simple, low-noise, solar-blind detectors in contrast to visible and infrared detectors which are noisier even when cooled. Pre-treatment is far simpler, since the inorganic gases and lighter hydrocarbons, which are difficult to remove, do not interfere in the ultraviolet. The system is relatively simple and can probably be fabricated to be both rugged and inexpensive. Though other techniques, particularly those based on emission characteristics, may ultimately be utilized in more sensitive, more compact, or more rapid instruments, their potential is not yet demonstrated. If the advantages of the ultraviolet detector are exploited, it should be possible to design a detector with operating characteristics as good as those of the best instruments available.

16335

Helbig, Herbert

USE OF AMPEROMETRY AND RELATED METHODS OF ELECTROCHEMICAL ANALYSIS IN OPERATING MEASURING TECHNIQUES. (Die Amperometrie und mit ihr verwandte elektrochemische Analysenmethoden in der Betriebsmesstechnik). Text in German. Chem. Tech. (Berlin), 21(9):553-557, Sept. 1969. 53 refs.

After reviewing the theoretical principle of amperometry, the determination of substances such as oxygen, chromate, nitric oxide, and sulfur dioxide by this method is discussed. Two metallic electrodes submerged in the solution to be analyzed are used. It is important that the reaction at the electrode is so rapid that only the substance transported from the solution to the phase boundary determines the reaction speed. The electric current at the electrode is then directly proportional to the concentration of the substance to be measured. For measuring nitric oxide, amperometry has the disadvantage that at concentrations of more than 2%, the substance transport is so rapid that the current density no longer depends on the concentration. In this case, it is better to use chronocoulometry. Potential is applied in jumps to the electrode instead of the stationary current and the current flowing within a certain time interval after the jump is integrated. For measuring SO2 in waste gases, waste gas enters a solution of 0.5 m sulfuric acid and 0.05 m potassium bromide at constant speed. Current enters the solution via two platinum electrodes. Bromine develops at the anode and is reduced by the SO2. The redox potential of the solution is measured with a third platinum electrode and a reference electrode. Minimum concentrations of 0.1 to 1 ppm and maximum concentrations of 1 to 10 ppm can be measured.

16398

Noyes, Claudia Margaret

STUDIES OF THE DETERMINATION AND REACTIONS OF SULFUR DIOXIDE AS AN AIR CONTAMINANT. Colorado Univ., Boulder, Thesis (Ph. D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1966, 56p. 38 refs.

Analytical methods for sulfur dioxide determination, including colorimetric and conductrometric methods, were evaluated, and the reactions of sulfur dioxide with hydrocarbons and nitrogen oxides at high dilution in air were studied. Radioactive S(35)O2 was used as a tracer to follow SO2 in the gas phase and after its absorption in the sampling solution. The West-Gaeke colorimetric method gave slightly less color but better reproducibility and sample stability than the Helwig-Gordon method. Liquid scintillation counting showed that the dilute hydrogen peroxide-sulfuric acid solution used for absorbing SO2 in the Thomas conductometric method was also less sensitive and less reproducible than the West-Gaeke colorimetric method. It was emphasized that the use of bubblers in series is not necessarily a reliable method for measuring absorbing efficiencies of solutions for gases. None of the mixtures showed any measurable amount of reaction of SO2 in dry or moist air in the dark during residence times as long as three weeks. Since there was a reaction of SO2 in an irradiated mixture containing both NO2 and hexene in dry air but none with either NO2 or hexene alone, it seemed probable that SO2 reacts with a product of the hexene-NO2 photolysis. There was no appreciable SO2 reaction in an irradiated mixture with benzene alone or in the presence of NO2. All products of the SO2 reactions were absorbed, since both color and counts were low in the gaseous aliquots taken from flasks immediately after irradiation. Whether the SO2 is oxidized or held in some form not detectable by colorimetric analysis is not known. It is definite that those reaction products which do not react as SO2 in the colorimetric determination do not remain in the gaseous phase. (Author abstract modified)

16516

Burough, I. G.

ATMOSPHERIC OZONE MEASUREMENTS. (FINAL REPORT). Dalmo Victor Co., Belmont, Calif., Contract PH 86-68-55, 50p., Dec. 12, 1967. 1 ref.
CFSTI: PB 187392

Long path infrared absorption measurements of atmospheric ozone concentrations in Los Angeles were performed using an ozone sensor. The sensor measures ozone concentrations as a function of time. It consists of a transmitter and a receiver which are separated by a line-of-sight path of 800 feet to 1600 feet. Since the ozone sensor measures ozone in terms of its optical absorption, it was necessary to provide a concentration, path length, and calibration factor. The calibration was accomplished by the introduction into the optical path of a test cell of accurately known length. The test cell is filled with ozone generated by passing oxygen through a high voltage electric discharge apparatus. The quantity of ozone was determined chemically. The concentration of ozone in the test cell is increased by the ratio of the nominal operational path length to the test cell length. Data were collected in the downtown Los Angeles area and from three other ozone sensors. The correlation between the infrared ozone sensor and the other instruments was calculated. The correlation coefficient between the infrared ozone sensor and the three other systems was consistently the lowest tabulated. The lower correlation was the

result of two factcrs: the infrared sensor is specific to ozone as opposed to total oxidants, and qualitative tests indicated that the infrared sensor in insensitive tc atmospheric quantities of SO2 or NO2; the infrared sensor provides an average value by measuring over a long sample path, as cpposed to the cther three instruments which are point samplers. Ozcne sensor data were given.

16543

Terabe, Motoji

METHODS FOR MEASURING GASECUS AIR PCLLUTANTS. (Yudoku gasu nc kenchi sokutei to sono kanren kiki ni tsuite). Text in Japanese. Kcgai to Taisaku (J. Pollutica Control), 2(7):453-459, Aug. 15, 1966. 5 refs.

Measuresents of air pollutants are roughly classified as chemical, physical, and biological. Chemical measurements are subdivided into test-paper, colorimetric, test tube, titration, gas volume, weight methods, etc. Physical methods are subdivided into mechanical, electrical, and optical method. Biological measurements make use of the human nose, small animals, and plants. The measuring methods are also classified according to time interval into integral, instantaneous, and continuous measurements. The collectica method for test samples is divided into absorption tube, vacuum substitutica, air substitutica, liquid substitution, and automatic ccntinuous gas sampler method. The absorption tube method and gas sampler used by National Air Sampling Network of the U. S. are discussed in detail. Sulfur oxides are measured by the West and Gaeke method, the lead dioxide method and recorded by the electric conductivity method. Nitrogen oxides are measured by the Saltzman method, the Yacobs method, and test tube methods, and recorded by an automatic recorder. Hydrogen sulfide is measured by the methylene blue method and recorded by an automatic recorder. Carbon monoxide is measured by hopcalite according to a test tube method, detected by Kitagawa detector, and recorded by an automatic recorder. Ozone is measured by iodimetry, phenolphthalein, ferrous thiocianate, the gum crack method, and an ozone meter. The operatica of each instrument is reviewed.

16616

Hiam, Leon and Saul Chaikin

DEVELOPMENT OF A SIMPLE AUTO EXHAUST ANALYZER. (FINAL REPORT.) Stanford Research Inst., Menlc Park, Calif., Contract PH 86-66-60, SRI Proj. PMU-5859, 18p., Aug. 1966. 23 refs.

The feasibility of applying a heated filament combustible gas detector for separately analyzing the total hydrocarbons and carbon monoxide in auto exhaust gases was determined. The first phase was a detailed study of the filament temperatures required for oxidation of selected hydrccarbons and CC on a platinum filament. Additional work was conducted on the effect of O2 and hydrocarbon concentratica cn the oxidatica initiation temperature;

the interacting effects in simple gas mixtures were studied. The data showed that the required analyses could not be made on the basis of the platinum filament temperature. Rhodium, iridium, palladium, palladium-silver, and palladium-gold alloys, oxidized nickel, gold, and oxidized cobalt were tested in a search for materials which might show greater selectivity in catalyzing oxidation of hydrocarbons and CO. None of these materials were found to make the required analyses feasible on the basis of filament operating temperature. Two procedures were evaluated for making a preliminary separation before analysis with a heated filament. Hopcalite catalyst was used to remove the CO from the gas sample by selective oxidation. Problems associated with the adsorption of hydrocarbons on Hopcalite made the procedure of doubtful use. Silica gel was used to selectively remove hydrocarbons from the gas sample so that an analysis for CO could be made on the heated filament. The complications it introduced were such that the basic simplicity of the combustible gas detector was lost. Since the separate analyses for hydrocarbons and carbon monoxide did not seem feasible, an effort was made to construct a detector that would measure total combustibles minus hydrogen and the lower aliphatic hydrocarbons. The procedure utilized a platinum wire 'preburner' whose function was to selectively combust hydrogen. This procedure did not succeed because carbon monoxide was found to inhibit the selective combustion of hydrogen over platinum at low temperatures. It was concluded that the combustible gas detector does not show any great potential for auto exhaust analysis. (Author summary modified)

16721

Kaye, S. and J. E. Koency

A SOLID STATE OZONE GENERATOR. Rev. Sci. Instr., 40(3):505-506, March 1969. 2 refs.

A small solid-state generator for preparing ozone in known concentrations to 1000 ppm in air for use in laboratory studies is discussed. Assembled from common electronic components, it is stable, reliable, inexpensive, and requires no cooling. The circuit and assembly is described in detail.

16781

Vogh, J. W.

NATURE OF ODOR COMPONENTS IN DIESEL EXHAUST. J. Air Pollution Control Assoc., 19(10):773-777, October 1969. 7 refs.

Offensive exhaust odors are characteristic of diesel engines. One problem in control and reduction of odor is lack of understanding of odorant sources and mode of formation. The solution of this problem depends on identification of the odorants so that study of their formation and control can be undertaken. A human panel performed odor assessments in studying raw and modified diesel exhaust and synthetic blends representing portions of diesel

exhaust. Their assessments were used in determining odorant identity and quantitative contribution to exhaust odor. Low molecular weight aldehydes appear to contribute little to diesel odors. The sulfur and nitrogen oxides have been examined as odorants but of these apparently only nitrogen dioxide is a potential odor contributor. (Author's Abstract)

16857

Healy, Thomas E. and Paul Urone

GAS CHROMATOGRAPHY OF OXIDANTS USING A FLOWING LIQUID COLORIMETRIC DETECTOR. Anal. Chem., 41(13):1777-1780, Nov. 1969. 17 refs.

A flowing liquid colorimetric detector was used for the gas chromatographic determination of hydroperoxides and nitrogen dioxide for possible application in air pollution studies. Half the effluent from the column went to a flame ionization detector, and half to a bubbler, in which the hydroperoxides reacted with a flowing ferrous thiocyanate liquid reagent. The liquid passed through a colorimeter, and the transmittance was recorded automatically. Several stationary phases were studied; the best was polyethylene glycol 400 on Chromosorb G, treated with hydrogen peroxide. The detection limit with the apparatus used was about nine micrograms of hydroperoxide. Nitrogen dioxide eluted from the same stationary phases; but, on most of them the colorimetric detector indicated that only about 1% of the eluted sample gave the NO2 colorimetric reaction. (Author's Abstract)

16881

Inaba, Humio, and Takao Kobayasi

LASER-RAMAN RADAR FOR CHEMICAL ANALYSIS OF POLLUTED AIR. Nature, 224(5215):170-172, Oct. 11, 1969. 8 refs.

A laser-Raman radar system which is suitable as an air pollution probe in real time is discussed briefly. The technique is based on measurement of the backscattered energy composed of Rayleigh and Mie scattering components of the frequency, and the Raman shifted frequencies due to various Raman active gases in the atmosphere, which can be detected simultaneously through optical filtering devices with multi-channel sensitive detectors.

17023

Warren, Gary J. and Gordon Babcock

PORTABLE ETHYLENE CHEMILUMINESCENCE OZONE MONITOR. Rev. Sci. Instr., 41(2):280-282, Feb. 1970. 2 refs.

A portable monitor for ozone makes use of the chemiluminescence produced by ethylene gas in contact with ozone. The instrument comprises a mixing chamber, photomultiplier, nanoammeter, high voltage supply, pump, flowmeters, and ethylene supply. Instrument operation is simple: air containing ozone is drawn into the mixing

chamber through an inner tube at 1 l/min. Ethylene is injected at 13 ml/min into an outer tube, and the two streams meet at the photomultiplier face. The monitor is easily calibrated by the buffered KI method. One serious problem associated with using the monitor around an accelerator is its sensitivity to radiation. A radiation field of 1 mR/h from a radium source, for example, produces a current equivalent to 6 ppm. This trait can be used to some advantage by using a small source to check instrument operations. When low concentrations are being measured, the instrument must be shielded or a sample pulled through tubing from the radiation area.

17024

Fukushima, Tatsuhisa, Mineo Shibano, and Touichi Ohtani

SPECTROMETRIC DETERMINATION OF MASS OF HYDROCARBONS AND NITRIC OXIDE IN AUTOMOTIVE EXHAUST GAS. (Jidosha haiki gasu chu no tanka suiso oyobi chisso sankabutsu shitsuryo bunseki). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 23(4):291-295, 1969. 7 refs.

Hydrocarbons and nitric oxide in automotive exhaust gas contribute to smog formation. Each hydrocarbon molecule type has a different smog formation potential. Mass spectrometric analysis for hydrocarbons and nitric oxide was developed. A continuous hydrocarbon and nitric oxide batch analysis was also established. (Author abstract modified)

17047

Wallace, I. D., D. W. Kohlenberger, R. J. Joyce, R. T. Moore, M. E. Riddle, and J. A. McNulty

COMPARISON OF OXIDATIVE AND REDUCTIVE METHODS FOR THE MICROCOULOMETRIC DETERMINATIONS OF SULFUR IN HYDROCARBONS. Anal. Chem., 42(3):387-394, March 1970. 16 refs.

Two microcoulometric methods for the rapid determination of total sulfur in hydrocarbons were compared. In the oxidative method, sulfur as SO2 is coulometrically titrated with iodine. In the reductive method, sulfur as H2S is coulometrically titrated with Ag(+). For either method, duplicate determinations require only 10 minutes. Precision is in the order of plus or minus 0.2 ppm or plus or minus 3%, whichever is greater. The oxidative method is simpler to use and is low in nitrogen interference. However, it suffers from chlorine and heavy metals interference and nonstoichiometric conversion of sulfur to SO2. The reductive method is free from chlorine and heavy metal interference, is stoichiometric for most sulfur types, but suffers from nitrogen interference. The availability of both methods allows the determination of total sulfur in nearly every type of hydrocarbon sample encountered in the analytical laboratory. (Author abstract modified)

17048

Robinson, J. W., C. Woodward, D. M. Hailey, and H. M. Barnes

THE POTENTIAL DETECTION OF POLLUTANTS IN THE ATMOSPHERE USING A REMOTE SENSING DEVICE. Preprint, Am. Chem. Soc., Pittsburgh, Pa., Div. Water, Air Waste Chem., 7p., 1969. 4 refs. (Presented at the American Chemical Society, 158th National Meeting, Division of Water, Air, Waste Chemistry, New York, Sept. 1969.)

Tentative experimental results indicated the possibility of remote sensing by means of laser induced fluorescence for the qualitative and quantitative identification of gaseous air pollutants. The wavelength of the fluorescent bands of organic molecules, such as sulfur dioxide, nitrogen dioxide, and tetrathyl lead in the gas phase, coincided closely with the infrared absorption spectrum of the molecules, thereby permitting identification of each component by its spectral analysis. The intensity of the fluorescence was found to be proportional to the concentration of the fluorescing molecule present, thereby allowing a means for quantitative determination. In order for this method to become a reliable analytical tool, the effects caused by quenching and enhancement on the fluorescence intensity must be examined. Further work is in progress.

17094

Regener, Victor H.

ON A SENSITIVE METHOD FOR THE RECORDING OF ATMOSPHERIC OZONE. J. Geophys. Res., 65(12):3975-3977, Dec. 1960. 4 refs. (Presented at the 12th General Assembly of the IUGG, Helsinki, Finland, Aug. 4, 1960.)

A device which uses the luminescence of a dry substance in the presence of ozone for the automatic quantitive determination of minute concentrations of atmospheric ozone is described. The sensitivity of the device is extremely high and the response is instantaneous. Since there are no liquid chemicals, the method can be used at extreme heights in the atmosphere; it is equally applicable to the continuous monitoring of ozone near the earth's surface. A schematic diagram of the nitrogen dioxide insensitive ozone sonde in its present form is given. Operational procedures are described. A photograph of the original flight record obtained over New Mexico is shown. The flight reached a maximum altitude of 33.5 km. The chart shows a considerable amount of detail of the vertical ozone distribution in the troposphere. Above the tropopause, the ozone density begins to rise. There is a secondary ozone maximum at a height of 15 km during the ascent, as well as during the descent.

17128

Saltzman, Bernard E.

PREPARATION AND ANALYSIS OF CALIBRATED LOW CONCENTRATIONS OF SIXTEEN TOXIC GASES. Anal. Chem., 33(8):1100-1112, 1961. 20 refs.

The development and testing of analytical methods for the accurate determination of low concentrations of various toxic gases are described. All-glass flow systems were preferred for the dilution of gases with purified air, since such systems avoid serious errors from surface adsorption or reaction with impurities. Several practical flow dilution systems are described and diagrammed, as well as an asbestos plug flowmeter which was found useful for metering flows varying from a few hundredths of a milliliter to a few milliliters per minute; motor-driven glass syringes can also be used for metering gas (and liquid) flows in these ranges, but have the disadvantage of intermittent operation. Rotameters are convenient for metering gas flows greater than 10 ml/min, but because of calibration difficulties are considered secondary rather than primary measuring devices. In an evaluation of chemical analytical methods, it was found that many of the methods available were based on assumptions derived from studies conducted either at high gas concentrations or in liquid solutions; various difficulties are encountered when such methods are critically tested at low concentrations. The methods finally selected were first tested for sensitivity for samples of reasonable size; results consistent with both sample volume and test gas concentration; adequate absorption efficienty with the available sampling equipment; and adequate stability of reagents and final solutions. The role of sampling absorption efficiency is developed mathematically, and midget sampling equipment described. Finally, methods are given for each of the following gases: ammonia, arsine, bromine, carbon dioxide, carbon monoxide, chlorine, chlorine dioxide, ethylene oxide, hydrogen chloride, hydrogen cyanide, hydrogen fluoride, monoethanolamine, nitric oxide, nitrogen dioxide, phosgene, and stibine.

17279

Terabe, M.

PREPARATION OF STANDARD DILUTED GAS FOR CALIBRATION BY TEFLON PERMEATION TUBES. (Pamieision chubu ni yoru biryo hyojun-gasu no chosei-ho to oyo). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 6(7):18-21, 1969. 9 refs.

The phenomenon that a liquid gas (sulfur dioxide, nitrogen dioxide, propane, butane) permeates through the tube wall within a teflon tube at a constant rate was studied. The tube had an internal diameter of 0.062 in., a wall thickness of 0.012 in., and an internal temperature of 20.1 plus or minus 0.1 C. The permeation rate of 25 C was 0.58 micrograms/min/cm. By the use of these permeation tubes, a dynamic calibration of automatic SO2 or NO2 measuring instrument, an evaluation of the characteristics of SO2 monitoring instrument, and an adjustment of automatic NOX measuring instruments can be performed.

17283

Okita, Toshiichi

AIR POLLUTICN CCNTBCL RESEARCH IN U. S. A. (PART I). (Taiki osen o mguru Amerika no kenkyu taisei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(1):38-48, Jan. 15, 1970.

Personal remarks and opinicns cf the approach the United States takes for air pollution control are presented. The U. S. appears to be concentrating on experiments of photochemical reactions in the atmosphere and on the advancement of air pollutant measurement methods. The general research trend is moving towards dry methods for lower costs in the labor force and for chemicals. Some meters and instruments currently devised and some measurement meters tested were a carbon monoxide meter capable of measuring CO densities below 1 ppm which can not be analyzed by the ordinary use of infrared rays, and a carbon dioxide recorder based on a Photometric Flame Detectcr. The simultaneous measurement of oxidants and ozone was also accomplished. Ozone measurement by use of rohdamine B is to be adapted as a standard meter after test results prove reliable and sufficient. Size distribution analysis in atmospheric corpuscles where size determines the extent of the effect on human bodies is also being tested. The technique can be applied to atmospheric corpuscles placed through a filter at the sixth cascade of an Anderson cascade impactor and collected in reinfcrced air stream. Other research activities and instruments were reported.

17347

Savvin, S. B., T. G. Akimova, V. P. Dedkova, and G. M. Varshal

DETERMINATION OF SULPHATE IONS IN NATURAL WATERS AND ATMOSPHERIC PRECIPITATION. (Opredeleniye sul'fat-icnov v prirodnykh vodakh i atmosfernykh osadkaka). Text in Russian. Zh. Analit Khim. (Moscow), 24(12):1868-1870, Dec. 1969. 10 refs.

A titrimetric method for determining sulfate ion in natural water and atmospheric precipitation, which utilizes an indicator for barium ion called orthanilic K, was developed. This methcd was demonstrated with samples containing 1.5 micrograms/ml sulfate ion. Analysis of 1-20 samples, including column purification, takes 15-60 min, depending upon sample volume and sulfate ion content.

17351

Osherovich, A. I., M. Ya. Rozinskiy, and Sn. A. Furman

A CCMPARISON BETWEEN THE M-83 STANDARD CZONOMETER AND AN CZONOMETER EQUIPPED WITH NARROW-EAND INTERFERENCE FILTERS. Bull. Acad. Sci. USSR, Phys. Atmos. Oceans (English translaticn from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmcsfery i Okeana), 5(10):593-596, Oct. 1969. 8 refs.

Soviet ozonometer stations are presently equipped with M-83 photoelectric filter ozonometers. These instruments have light filters consisting of colored glasses with wide passbands. When their performance was compared with that of ozonometers having narrow interference filters constructed of alternate layers of lead fluoride and cryolite, the M-83 instruments showed spurious daily ozone variations. One some days, the daily average total ozone content as read from the M-83 differed from that obtained with the other instruments by a factor of nearly two. Because of the large solid angle of the M-83 receiver, total recorded ozone content was too low. Consideration should be given to equipping the Soviet ozonometer network with new and more accurate instruments.

17380

Freedman, Robert W., B. A. Culehan, and H. W. Lang

KINETIC EVALUATION OF THE FACTOR USED IN THE SALTZMAN ANALYSIS OF OXIDES OF NITROGEN. Am. Ind. Hyg. Assoc. J., 31(1):76-80, Feb. 1970. 12 refs.

The Saltzman reaction commonly used for analyzing atmospheric concentrations of nitrogen oxides involves the diazotization of sulfanic acid by nitrous acid, followed by coupling with N (1-naphthyl)-ethylenediamine to yield an azo dye. The raw results are generally divided by a factor of about 0.7 to compensate for the formation of nitric acid. A modification of the reaction is used at the Bureau of Mines to analyze diesel exhaust gas in which concentrations of nitrogen oxides are higher than ambient levels by a factor of 100. The exhaust gases are collected directly from the engine, mainly in the form of nitric oxide, in vacuum bottles. This permits rapid formation of nitrous acid followed by diazotization and coupling long before the gas-phase oxidation of nitric oxide is allowed to proceed to completion. To explain the quantitative yield (factor equals 1.00) obtained with the modified Saltzman method, the overall reaction kinetics were evaluated. The overall reaction consisting of the gas-phase oxidation followed by solution in and with reaction Saltzman's reagent was pseudo-third order. The overall reaction is quantitative as shown by comparison with the phenoldisulfonic acid method. Oxides of nitrogen exist almost exclusively as nitric oxide at engine temperatures, and very rapid sampling directly into the Saltzman reagent provides insufficient time for the nitrogen dioxide to total nitrogen oxides ratio to exceed 0.5. The Saltzman 'factor' decreases linearly with the log of initial concentration. This was true over the concentration range measured (400 to 2800 ppm) starting with either nitric oxide or nitrogen dioxide.

18013

Papa, Louis J.

COLORIMETRIC DETERMINATION OF CARBONYL COMPOUNDS IN AUTOMOTIVE EXHAUST AS 2,4-DINITROPHENYLHYDRAZONES. Environ. Sci. Technol., 3(4):397-398, April 1969. 11 refs.

A colorimetric technique was developed for determining the total molar concentration of carbonyls in a mixture of their 2,4-dinitrophenylhydrazones (DNPH). The method is based on the measurement of the colored species formed when alkali is added to a solution of the DNPH's in a 70% pyridine medium which stabilizes the colored product. The method is applied to the analysis of carbonyls in vapor mixtures and automotive exhaust via collection of the DNPH derivatives in scrubbers. The recovery of the carbonyls by this technique is 98 to 106% and the reproducibility is plus or minus 3% relative. (Author's Abstract)

E. CONTROL METHODS

00003

HEARINGS - S 306. A Bill to Amend the Clean Air Act to Require Standards for Controlling the Emission of Pollutants from Gasoline-Powered or Diesel-Powered Vehicles, to Establish a Federal Air Pollution Control Laboratory and for Other Purposes. 89th Congress (1st Session) Senate Committee on Public Works. Special Subcommittee on Air and Water Pollution. April 9, 1965. 308 pp.

This document contains Government reports, statements made by Government officials and industrial representatives, and communications to Senator Muskie. The following topics are discussed: (1) photochemical smog; (2) effects of air pollution; (3) vehicle use trends; (4) recognition by state governments; (5) exhaust and crankcase emission control; (6) fuel evaporator loss control; (7) fuels; and (8) diesels. Also included are reports on causes and control of automotive emissions, by J.D. Caplan; and descriptions of visits to General Motors Research Laboratories, Ford Motor Co. Vehicle Emissions Testing Laboratory, American Motors Corp. (Air-guard system for exhaust control), and to Chrysler Corp. Laboratories (Clean air package components).##

00015

L. J. E. Hofer, J. F. Shultz, and J. J. Feenan

EFFECT OF LEAD DEPOSITS ON ACTIVITY OF AUTOMOTIVE EXHAUST CATALYSTS. Bureau of Mines, Washington, D.C. (Report of Investigations 6243.) 1963, 26p.

This study, part of a broad program of research in air pollution related to minerals, was conducted to determine the nature and extent of the poisoning of catalysts when used to remove certain air pollutants from exhaust gases. The poisoning examined in this investigation occurs when leaded gasoline is used as a fuel for automotive engines. The smog in the Los Angeles area is attributed to the effect of radiant energy on the mixture of hydrocarbons and nitrogen oxides found in the atmosphere there. To prevent the escape of these hydrocarbons into the atmosphere catalytic mufflers have been proposed. In principle, these are simple and nonmechanical, consisting of a vessel charged with a catalyst capable of destroying the exhaust hydrocarbons by catalyzing their oxidation. However, these catalysts are severely affected by the particulate matter, mainly in the form of lead sulfate, lead oxysulfate, and lead chlorobromide, contained in the

exhaust gas. Deposition of lead on the catalyst restricts catalytic activity. After 20,000 miles of operation, the temperature necessary to achieve 50% conversion of isopentane in a mixture of 0.2% isopentane, 2% CO and 4% oxygen, and the balance N at 10,000 hourly space velocity has risen from 400 to 500 C. even with a catalyst taken from the exit portion of the catalyst bed. The rest of the catalyst was more severely affected. It would appear that operation for 20,000 miles is near the limit for a catalyst.##

00097

L.L. Winkstrom K Nobe

CATALYTIC DECOMPOSITION OF NITROGEN DIOXIDE. California Univ., Los Angeles, Dept. of Engineering. (Report 63-19.) Apr. 1963. 40 pp.
CFSTI, DDC: AD 406834

Reactions of the oxides of nitrogen are of considerable interest in current air pollution research. The investigation reported in this paper is the study of the complete dissociation of NO2 in nitrogen and in air with CuO-Alumina (1:1) and CeO2-Alumina (1:1) catalysts. The initial concentration of the NO2 was varied within the range 720-2200 ppm. The reaction was studied in a steady-state isothermal flow reactor with the temperature varied in the range 304 - 520 C at gas space velocities (STP) ranging from 1,400 to 11,200/hr. It was observed that the kinetic data were best represented by the rate expression, r=ap / (1 plus bp). At low temperatures and high flow rates the rate reduced to a zero order reaction. Below 480 C the CuO had a higher catalytic activity than the CeO2. Above 480 C, however, the CeO2 had a higher activity. It was observed that there was considerable decomposition of NO2 even in excess air with CuO catalysts. Since it had been reportd previously that CuO catalysts were quite satisgactory for hydrocarbon oxidation, the results of this investigation indicate that both hydrocarbons and oxides of nitrogen may be simultaneously eliminated to a considerable degree with CuO catalysts. (Author)##

00107

S. S. Griswold

CONTROL OF STATIONARY SOURCES (TECHNICAL PROGRESS REPT. VOLUME 1). Los Angeles County Air Pollution Control District, Calif. Apr. 1960. 191 pp.

As a result of the intensive source control measures administered in Los Angeles County, virtually all industrial operations have been brought within the scope of the air pollution control program. From the melting of metal to the painting of manufactured goods, specific industrial processes and equipment have been subject to air pollution control measures. This volume provides individual discussion of control techniques applied to the

most significant stationary sources of air contamination. Certain source emission problems, such as those traceable to the operation of railroad locomotives and ships, are not discussed in this volume in view of the current unimportance of the source. The material reported in this volume generally contains only those developments occurring subsequent to the publication of the Second Technical and Administrative Report on Air Pollution Control in Los Angeles County, 1950-51. (Author)##

00131

H. F. Lund (Ed.)

INDUSTRIAL AIR POLLUTION. Factory 123, (10) 90-101, Oct. 1965.

A review of industrial air pollution problems and their solution is presented. The effectiveness of federal, state and local efforts on this problem, as well as the steps that industry has taken to control it, are discussed. Recommendations include: education of the public, a national planning program supported by industry, federal and state governments, federal legislation, less costly and more effective equipment for containing and preventing the nuisances.##

00154

Beckman, E. W., W. S. Pagley, and Jorma O. Sarto

EXHAUST EMISSION CONTROL BY CHRYSLER - THE CLEANER AIR PACKAGE. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, New York, Society of Automotive Engineers, Inc. 1966, p. 178-191. 16 refs. Also: 90th Congress ("Air Pollution--1967, Part I (Automotive Air Pollution)" Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, U.S. Senate, Feb. 13-14, 20-21, 1967, p. 411-424.)

Air pollution problems in California required control of vehicle exhaust emissions. The early development of catalytic converters and direct flame afterburners led to relatively complex mechanisms with substantial added cost to the vehicle. An evaluation of the primary factors affecting exhaust emissions indicated the feasibility of control by engine modification alone. A series of engine modifications were subsequently developed which reduced the exhaust emissions to below the California standard of 275 ppm hydrocarbons and 1.5% carbon monoxide. b8the primary changes were to employ optimum combinations of fuel-air mixture and spark timing at all operating conditions. These changes are known as the "cleaner Air Package" (CAP). 50,000 mile tests indicated that with normal maintenance the exhaust emissions were stable and remained at a low level. The CAP system was put into production on 1966 model Chrysler Corporation passenger cars and light trucks marketed in California.##

00171

THE CONTROL OF AUTOMOBILE EMISSIONS. (FORD CRANKCASE EMISSIONS CONTROL SYSTEM. FORD THERMACTOR SYSTEM FOR EXHAUST CONTROL.) Ford Motor Co., Dearborn, Mich., Engineering Staff. 1966. 6 pp.

An explanation of both Ford's Engine Crankcase Ventilation and Thermactor Exhaust Emissions Control Systems, complete with schematic drawings of cross-sections of the automobile engines is presented. The rationale for its development, the chemistry involved, and the future implications of the systems are discussed.##

00269

V. H. Luther, K. Lchner, H. Muller, and W. Zander

POSSIBILITIES OF DECONTAMINATING EXHAUST GASES OF OTTO ENGINES. Moglichkeiten einer Entgiftung der Abgase von Ottomotoren. Erdoel Kohle (Hamburg) 18(12):964-972, Dec. 1965. Text in German.

The composition of motor exhaust gases is discussed. Measuring methods and the possibility of decontamination before, in, and behind the combustion chamber are described in detail. Fundamental principles of the Cleaner Air Package, crankcase blowby control devices, after-burner with spark ignition, and the Man-Air-Ox system are given. The state of the art of catalytic combustion is summarized and it is shown that the combination of other after-burner systems with small catalyst units are worthy of further development.##

00569

D. J. Addicott and J. G. Mingle

PARTIAL RECIRCULATION OF DIESEL ENGINE EXHAUST FOR REDUCTION OF OXIDES OF NITROGEN. Preprint. (Presented at Second Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Portland, Oreg., Nov. 5-6, 1964.)

N oxides are formed in overlean regions during the heterogeneous combustion of the diesel engine. This paper describes a series of tests wherein up to 11% diesel engine exhaust gas was recirculated into the intake manifold. N oxides concentration, smoke, power, exhaust temperature, and fuel-air ratio are shown as a function of the percent of exhaust gas recirculated. The results of these tests show that the concentration of N oxides in the exhaust gas remained essentially constant, at 300 ppm, up to 8% of exhaust gas recirculation. The concentration then increased rapidly to 700 ppm at 11% of exhaust gas recirculation. Increasing the percent of exhaust recirculaton from zero to 11% caused the fuel-air

ratio to increase from 0. 050 tc 0. 065. As the percent of recirculated exhaust gas increased, so did the temperature of the recirculated portion of the exhaust increase. This increase of temperature is postulated to have increased the peak cycle temperature within the combustion chamber and thus increased the N oxides emission. It is further postulated that no reduction in N oxides emission will be obtained from recirculating exhaust gas unless the recirculated gas is cooled. The concentration of N oxides in the exhaust gas was determined with a spectrophotometer constructed at Oregon State University. (Authors' abstract) ##

00959

B. B. Sundaresan, C. I. Harding, F. P. May, and F. R. Hendrickson

A DRY PROCESS FOR THE REMOVAL OF NITROGEN OXIDES FROM WASTE GAS STREAMS IN NITRIC ACID MANUFACTURE. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper 66-96.)

Experimental studies were conducted using a commercial zeolite to remove NOx from waste gas streams in a nitric acid plant. NOx retained in the bed was recovered as enriched NOx and HNO_3 gy regenerating the bed at elevated temperatures with hot air and/or steam. Test results indicate that such a system could be incorporated into an existing nitric acid plant, thereby eliminating release of significant quantities of NOx into atmosphere. The conclusions are enumerated below: (1) A process to remove NOx from the waste gas streams of nitric acid plants has been found; (2) Complete NOx removal as proved by this system will eliminate release of NOx into the atmosphere; (3) Commercial zeolite used in this process can remove NOx along with most of the moisture present in the tail gas; (4) NOx and H_2O retained in the bed has been recovered as enriched NOx and HNO_3 for possible feedback into the process stream; (5) It has been estimated that in a 300 ton acid plant by feeding back the recovered NOx into the process stream, about 4 to 5 tons per day of 60% HNO_3 now being wasted could be added to production; and (6) The increased production should offset the additional investment for such a system, making the process economically feasible. (Author summary and conclusions) ##

00975

M. I. Weisburd, (Compiler and Ed.)

AIR POLLUTION CONTROL FIELD OPERATIONS MANUAL (A GUIDE FOR INSPECTION AND ENFORCEMENT). Public Health Service, Washington, D. C., Div. of Air Pollution, 1962. 291p.

Author discusses sources, control methods, training techniques and related aspects of air pollution. Document is an excellent source for specific information on equipment being used in air pollution control. Pictures, diagrams, schematics and charts are given.##

01125

D. Zanon and D. Sordelli

PRACTICAL SOLUTIONS OF AIR POLLUTION PROBLEMS FROM CHEMICAL PROCESSES . (Realizzazioni nel Campo delia Prevenzione dell' inquinamento Atmosferico di Origine Industriale.) Translated from Italian. Chim. Ind. (Milan), 48(2):251-261, March 1966.

A strict control of pollutant to be dispersed in the atmosphere offers technical and economic problems, both in the design and the operation of chemical processing units. Three examples of processes for which pollution control has been established are described: SO2 derived from contact sulfuric acid and from hydroxylamine sulfate plants, nitrous gas from low and high-pressure nitric acid plants, and fluorine-containing effluents from hydrogen fluoride production. The general approach, kind of abatement process adopted, materials and construction costs are discussed.##

01167

J. H. Ludwig

PROGRESS IN CONTROL OF VEHICLE EMISSIONS. J. Sanit. Eng. Div., Am. Soc. Civil Engrs., 93(SA-4):73-79, Aug. 1967.

Control of emissions from motor vehicles is reviewed from the standpoints of the contribution of vehicles to community air pollution, present progress in control regulations and application of devices, and the immediate and longer-term outlook for additional controls in the future. (Author summary)##

01219

Minhk, A. A.

THE HYGIENIC IMPORTANCE OF THE IONISED STATE OF THE AIR IN CLOSED PREMISES . Gigiena i Sanit. 25(1):78-83, 1960.
DDC: AD 481 527

The problem of the ionized condition of domestic atmospheres and that of public places is of great significance. However, it is impossible to attribute to ionization universal sanitary improving properties, which are, in fact, not inherent to it or in any case are not sufficiently proved. One should proceed from the point that atmospheric ionization is one of the factors connected with the atmosphere which is manifested in a background of definite interrelations with other physical and chemical factors. Thus one ought to solve the problem of the physiological significance of air ionization of premises as one aspect of the whole problem of atmospheric hygiene. Excessive overrating of the significance of the factor of air ionization, as is done in certain

popular scientific journals, can lead to unnecessary expenditure and discredit ideas regarding the hygienic importance of the electrical properties of air.##

01528

K. Guthmann

(NEW KNOWLEDGE AND EXPERIENCE IN THE PURIFICATION OF AIR IN FOUNDRIES.) Neue Erkenntnisse und Erfahrungen bei der Reinhaltung der Luft in Huttenwerken. Radex Rundschau (Austria), No: 3: 139-162, June 1966.

German laws, passed by the Federal Government, requiring maintenance of clean air, are discussed. Maximum allowable emission values for dusts, gases, and smokes are given. Programs established for research on the measurement of dust and SO2 and warning devices for smog are described. Other research described is being conducted on the removal of brown smoke in basic steelworks and oxygen-blowing steelworks, recovery of converter gas, possibilities for utilizing accumulated dust, removal of fluorine from exhaust gases and removal of odor from exhaust gases.##

01619

NITRIC ACID MANUFACTURE (INFORMATIVE REPT. NO. 5). J. Air Pollution Control Assoc. 14, (3) 91-3, Mar. 1964. (TI-2 Chemical Industry Committee).

Nitric acid manufacture by the ammonia oxidation process and the concentration process are described. The control aspects are discussed.##

01620

THE PETROLEUM REFINING INDUSTRY - AIR POLLUTION PROBLEMS AND CONTROL METHODS (INFORMATIVE REPT. NO. 1). J. Air Pollution Control Assoc. 14, (1) 30-3, Jan. 1964. (TI-3 Petroleum Committee).

Possible air-borne contaminants from refining operations are covered. Control methods for gaseous and particulate emissions, and the industry's research projects are reviewed.##

01645

A. J. Haagen-Smit

THE CONTROL OF AIR POLLUTION. Sci. Am. 210, (1) 25-31, Jan. 1964.

Using the development of Los Angeles' control program as an example, smog, dust, fumes, photochemical reactions, automotive emissions, control methods, emissions standards, and control devices are reviewed.##

C1791

G.A. Jutze R.J. Lewis

A METHOD FOR CHECKING INSTRUMENT PERFORMANCE AT REMOTE SAMPLING SITES. J. Air Pollution Control Assoc. 15, (7), 323-6, July 1965.

This paper describes a quality control technique used by the central headquarters operation of the continuous Air Monitoring Program in an effort to insure valid data production from instruments located at remote sampling stations. The procedure consists of preparation of 0.10 to 2.00 ppm mixtures of SO2 or NO2 in duplicate Mylar bags, each encased in a corrugated paper box. These mixtures are analyzed during make-up to insure duplication. One box is shipped to the field station where it is analyzed on-site. The control mixture is analyzed in the central lab at the same time. Correlation between measurements indicates the usefulness of this dynamic calibration check. The techniques used are described and results of the program are presented. (Author abstract)##

01928

J. Nilsen

AIR POLLUTION: COSTLY TO IGNORE, COSTLY TO CONTROL. Chem. ENG. 73, (15) 90-6, JULY 18, 1966.

Author discusses the ramifications that will result from the recent legislation dealing with air pollution control. The parameters of the pollutants per se, the role of industries responsible for the pollution, the problems of the municipalities which must cope with the pollution problem, the effects of standards and legislation, the eventual cost of pollution control and the research programs to be undertaken are discussed. Also included is a chart of forty-eight major United States cities and the concentrations (ppm) of nitrogen dioxide and sulfur dioxide which were found to be present.##

C2051

J. Feist.

THE CATALYTIC REDUCTION OF NITROUS GASES DURING THE MANUFACTURE OF NITRIC ACID. Die Katalytische Reduktion Von Nitrosen Abgasen Sei Der Erzeugung Von Salpetersaure. Proc. (Part I) Intern. Clean Air Corg., London, 1966. (Paper VI/15). pp. 199-202.

Discusses a catalytic reduction process for reducing nitric oxide present in the waste gases from nitric acid for manufacture to a concentration of 100 ppm. Flow sheets illustrate thermal integration of the catalytic process with the overall process. Discusses the use of metal and ceramic catalysts. (Author abstract)##

02440

G. J. Doyle and R. G. Caldwell

FEASIBILITY OF REMOVING GASEOUS CONTAMINANTS FROM MANNED SPACE-CABIN ATMOSPHERES BY IONIC PROCESSES (FINAL REPT. MAR. 1-OCT. 31, 1965.) Stanford Research Inst., South Pasadena, Calif. (Rept. SSU-5396) (AMRL - TR-66-22) (Project 6373) 67 pp., Feb. 1966

The application of ionic processes to the purification of manned space-cabin atmospheres was investigated in anticipation of a need for a radically new atmospheric purification system for some of the presently scheduled space journeys. Processes considered are (1) ion-molecule reactions of contaminant molecules with specific added molecules ions O2(+), O2(-) and (2) clustering of contaminant molecules about specific ions (H3O(+). Either reaction type can lead to charging of the contaminant molecules (or molecules derived therefrom), allowing collection by an externally applied electric field. Ion-molecule reactions were found to be potentially useful for removal of a large class of contaminant species. However, charge-trapping reactions involving such species as water and oxygen--occurring or energetically capable of occurring concurrently or subsequently to the desired reaction--could interfere, thereby allowing no clear-cut decision as to the applicability of ion-molecule reactions to purification. Clustering was investigated in greater detail than ion-molecule reactions. Detailed calculation of ion-polar molecule interaction energies for typical molecules were carried out to better accuracy than has been done heretofore. Competing reactions with water molecules will occur in presence of water vapor. However, if the ecological balance of the cabin would allow nearly complete and specific removal of water vapor, then clustering could be used to remove highly polar contaminants. A short experimental program to demonstrate feasibility is recommended. (Author abstract)##

02541

(SCIENTIFIC METHODS AND TECHNIQUES TO DECREASE THE POLLUTION OF THE ENVIRONMENT, THROUGH INHALATION OR INGESTION, AND OF ACOUSTICAL "NUISANCES.") Moyens scientifiques et techniques de diminuer la pollution des milieux inhales ou ingeres et des "nuisances" acoustiques. (Chapter 3: Les pollutions et "nuisances" d'origine industrielle et urbaine. Tome 1. Leur prevention et les problems scientifiques et techniques qu'elle pose en France.) Premier Ministre, Delegation generale a la recherche scientifique et technique. June 1966. pp. 47-59.

The functioning of chlorophyll in the course of photosynthesis in leaves of plants serves as a method of air purification of sufficient importance to consider its use in control. Vegetation, like men and animals, can sustain a considerable amount of damage to the point where the threshold limit of absorption of toxic substances is exceeded. The three gases causing the most damage to vegetation are carbon monoxide, the sulfur oxides, and those containing fluorine. Also to be considered are acid "smog", toxic "smog", ozone, and nitrogen oxides. Other industrial pollutants which have a toxic influence, but less sever and localized, are dusts, hydrogen sulfides, hydrochloric acid, etc. Ethylene and carbon monoxide cause great damage to the growth hormones, particularly auxin. The effects of SO2, SO3, and H2SO4 are related to the quanity of gas emitted, the degree of resistance of the species, their state of development, and the various environmental conditions. The sensitivity of vegetation to the action of sulfur gases varies essentially as a function of the speed of absorption of the gas by the leaves. Through experimentation it has been found that the plant species which are most sensitive to SO2 are chickweed, alfalfa, barley, oats, wheat, rhubarb, lettuce, endive, spinich, cabbage, and tobacco. Apples, apricots, peaches, grapes, corn, and beans are less sensitive, whereas the floral species such as gladiolus, rose, and lilac offer considerable resistance. Aquatic vegetation is often used as purifying means for polluted streams. Subsoils purify themselves of pollutant materials in various ways, including uptake by vegetation and dispersion in the soil with rain water, etc. In a section on means of decreasing the inhaled pollutants the following are mentioned: dust collectors, normal methods of dispersion in the atmosphere, fumes from domestic fires, auto exhaust fumes, fuel additives, improvement of combustion in engines, recycling of crankcase gases, post-combustion appliances, and redesigning of motors. Also given in this section (Chapter 3) is some similar information on ingested pollutants and on problems of noise.##

C2648

H. Kuhn and R. Tomingas

ATTEMPTS TO PREVENT THE FORMATION OF POLLUTANTS IN THE EXHAUST GASES OF TWO-STROKE ENGINES AND DIESEL ENGINES BY ACTIVATING COMBUSTION WITHIN THE ENGINE. Staub (English Translation) 25 (3) 2-17, MAR. 1965.
CFSTI TT66-51044/3

Combustion in two-stroke Otto engines and the diesel engine can be influenced by chemical fuel additives in such a way that oxidation is catalyzed and the side reactions of dehydrogenation and cyclization are suppressed. In the two-stroke engine it was possible largely to reduce the formation of benzpyrene by using salts and chelates of polyvalent metals, in particular manganese, and to prevent it completely by means of ether and ether-like additives. For precipitation of the oil mists and soot particles the "adhesive oil method" was employed. In the experiments the two-stroke engine was selected first; checking of the results by experiments on four-stroke engines is in preparation. In the case

of the diesel engine it has been possible to achieve a reduction in soot formation with overloading by 10 to 15%. (Author summary) ##

02951

A. C. Stern

AIR POLLUTION AND ITS ABATEMENT IN THE UNITED STATES. De Ingenieur 77, (29) G83-93, July 16, 1965 and 77, (31) G97-104, July 30, 1965. (Presented before the Dept. for Public Health Engineering, Royal Inst. of Engineers, Hague, Netherlands, July 3, 1964.)

In the United States, visible smoke is no longer a major problem. Present concern is principally with gases; their chemical reactions in the atmosphere; the effects of both gases and reaction products on humans, animals, plants, materials and visibility; and their abatement. Considerable emphasis is placed on the relation of meteorological conditions to air pollution levels. Forecasting of weather conditions conducive to build-up of pollution is now done routinely in the United States. Although air pollution research is conducted nationally, abatement is on local basis. The new Federal Clean Air Act seeks to improve the effectiveness of local agencies, and to provide for Federal abatement of interstate air pollution. (Author summary)

03061

THE ATLANTIC RICHFIELD NITRIC OXIDE REDUCTION SYSTEM. Preprint. Has now been published by the ARCO Chemical Co. Sept. 1966, 31 pp. ARCO Chemical Co., Anaheim, Calif. 1966

During the last six years an extensive study of the use of exhaust gas recirculation has been made and a simplified control system (Nitric Oxide Reduction System) was developed which eliminated many problems previously encountered and achieved the required reduction of nitrogen oxides without impairing vehicle performance. In this system exhaust gas is taken from the heat riser at a point directly beneath the carburetor, flow controlled by means of a butterfly control valve, then distributed to the individual passages of the intake manifold by means of distribution tubes. The control valve is actuated by the throttle linkage and designed to permit recycle flow at part throttle and cruising operations. For closed throttle operation such as idle and deceleration, and for wide-open throttle, when maximum performance is desired, the cycle rate control valve is in a closed position. The entire unit, with the exception of the rate control valve shaft and throttle linkage, is enclosed entirely within the intake manifold. It has been demonstrated that the use of recycle reduces peak temperatures and pressures. It is probable that the reduction of nitrogen oxides results from the reduction in peak temperature. Conceivably, the dilution of the air-fuel mixture by the presence of inert exhaust slows the rate of

combustion causing the lower peak temperatures. There are other possible benefits from the use of the system such as a reduction of hydrocarbons and cylinder bore wear, and less erosion of spark plug electrodes.##

03204

W. Ehnert.

THE BEHAVIOR OF NITRIC OXIDE DURING ELECTROSTATIC GAS PURIFICATION. Uber das Verhalten des Stickstoffmonoxids bei der elektrostatischen Gasreinigung. Brennstoff-Chem. (Essen) 9(7):273-274, Sept. 1966. Translated from German as JPRS B-8584-D.

The effects of field intensities, ionizing-electrode diameters, period of stay of the gas in the electrostatic purifier, concentrations of nitric oxide in the gas, and the presence of unsaturated compounds upon the decomposition of nitric oxide were measured by means of an experimental electro-filter situated in coke oven plant. Within the range of 3 to 3.8 kv/cm, the quantities of NO decline with increasing field intensity, this decline amounting to only about 10 to 20% at the field strengths of 2 to 3 kv/cm which are commonly used in coke-oven installations. Industrial-economic considerations however place a limit on the extent to which voltages can be increased in practice. The period during which the gases remain in the filter is a factor in the reduction of NO content, but a doubling of this period from 6 to 12 seconds results in a maximum increase in the decomposition rate of only 25%. The reduction in NO tends first to decline and then to increase as the diameter of the ionizing electrode is increased. The most effective factor in the reduction of NO contents is the addition of unsaturated compounds; thus the addition of 2.5 ml cyclopentadiene cu/m of gas increases the loss of NO by a factor of 4 under certain experimental conditions. The experiments show that current commercial coke-oven practice results in reductions of about 20% in NO content, and that an increase in the field strengths together with a rise in the unsaturated-compound contents can effect reductions of 50-60%.##

03401

F. Bonamassa

DESIGN CONSIDERATIONS OF A PHOTOCHEMICAL-ATMOSPHERE ENVIRONMENTAL TEST FACILITY. Am. Soc. Testing Mater., Spec. Tech. Publ. 352, 32-9 pp., Dec. 1963. (Presented at the Symposium on Air-Pollution Measurement Methods, Los Angeles, Calif., Oct. 5, 1962.)

A photochemical-atmosphere environmental test facility is a system designed to stimulate in the laboratory conditions existing in polluted atmospheres. These test environments are finding increasing applications in studying the effects of contaminated atmospheres on humans, animals, plants, or inanimate objects; evaluating air-pollution control systems;

establishing air quality standards and permissible contaminant-emission levels; idenitfying atmospheric pollutants and their reaction products; and investigating the mechanisms of reactions of polluted atmospheres. Many interdependent factors influence the design of a photochemical-environment test facility. Careful study of the proposed experimental program and its objectives is needed to determine the required test volume and operating conditions. The design and choice of construction materials reflect certain compromises, usually dictated by the relative importance of the various test conditions. Although probably no simulated photochemical atmosphere can ever completely reproduce all the conditions of the natural atmosphere, enough control over significant variables can be achieved to enable the test environment to assume an increasingly important role in increasing our understanding of the complex reactions and effects of photochemical air pollution and in providing much needed information for its effective control.##

03536

AUTOMOTIVE AIR POLLUTION III. (A REPORT TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 88-206, THE CLEAN AIR ACT.)
Preprint. 1965.

Reduced exhaust emissions of hydrocarbons and CO have become a reality in California with the introduction of the 1966-model passenger cars and light commercial vehicles. Recognition of the need for still further control measures is evidenced by the adoption of nitrogen oxide standards by the California Board of Health. The Department of Health, Education, and Welfare is implementing the new responsibilities and authorities conferred by the Motor Vehicle Air Pollution Control Act. Standards for the control of emissions from gasoline-fuelled vehicles are being developed accordingly, to become effective with the 1968 models. Some additional technical information has become available. Further studies of the effect of ambient temperature on exhaust emissions indicate that low temperatures tend to increase hydrocarbons and CO, particularly following cold-engine starts. Preliminary results obtained from a study of the effect of leaded fuels indicate that combustion chamber deposits may not significantly affect the quantities of hydrocarbons and CO emitted in exhaust gases. A survey being conducted to measure CO levels in urban communities suggests that human exposure to CO may be greater than routine atmospheric monitoring data had indicated. A number of new projects are being initiated by the Government to study the performance characteristics of production-type exhaust emission controls in varied environments, to develop more definitive data on exhaust emissions from small cars and diesel-powered vehicles, to learn more about human tolerance of lead and CO, and to effect control of oxides of nitrogen. An expansion of industry research in automotive air pollution and its control is indicated by the recent activities of technical associations. (Author summary)##

03762

Spencer, E. F., Jr. N. Kayne, M. F. LeDue and J. H. Elliott

EXPERIMENTAL PROGRAM FOR THE CONTROL OF ORGANIC EMISSIONS FROM PROTECTIVE COATING OPERATIONS (INTERIM REPT. NO. 2). Los Angeles County Air Pollution Control District, Calif. Jan. 1959. 40 pp.

This report discusses the equipment and procedures used in the evaluation of control equipment for solvent vapors from surface coating processes. A pilot plant which was used to recover organic solvents by means of activated carbon is described. Of the control methods evaluated, adsorption with activated carbon offers the greatest promise. The advantages of the activated carbon system are: (1) recovers solvent vapors in all concentrations below the flammable range; (2) recovers all types of volatile solvents; (3) recovers solvents efficiently in the presence of water vapor; (4) recovers solvent vapors with high overall efficiency; (5) operation of the equipment is simple; (6) the equipment is sufficiently flexible for all types of surface coating operations. Five complete adsorption-desorption cycles were completed. The adsorption efficiency before reaching saturation averaged 92 percent, while the desorption efficiency, based on solvent recovery vs. solvent adsorbed during the individual run, averaged 57 percent. Poor steam distribution is believed responsible for the incomplete desorption and the equipment is being modified to improve the stripping of the carbon. It is planned to investigate another fixed bed unit and one moving bed unit.##

03796

K. C. Stein, J. J. Feenan, G. P. Thompson, J. F. Shultz, L. J. E. Hofer, and R. B. Anderson

CATALYTIC OXIDATION OF HYDROCARBONS (AN APPROACH TO AIR POLLUTION CONTROL). Ind. Chem. Eng. 52, (8) 671-4, Aug. 1960. (Presented at the Division of Petroleum Chemistry, 135th Meeting Chemical Society, Boston, Mass., Apr. 1959.)

The hydrocarbons in the exhaust gases from automobile engines are a major source of the eye irritating smog occurring in urban areas. Catalytic oxidation applied where the pollutants originate in the individual vehicle is one of the methods of control. In a search for suitable catalyst components, a large number of metal oxides in granular form, unpromoted and unsupported, have been investigated by a new microcatalytic technique based on gas chromatography. The most active of the catalysts were, arranged in order of decreasing effectiveness, the oxides of cobalt, nickel, manganese, chromium, and iron. It is probable that different forms or preparations of the same oxide would have different activities. In general, the higher molecular weight hydrocarbons were more easily oxidized than the lower. Hydrocarbons of a

given carbon number increased in reactivity according to the series : aromatic, branched paraffin, alicyclic, normal paraffin, olefinic acetylenic. Fortunately, the olefinic hydrocarbons generally considered the most undesirable are relatively easy to remove.##

03798

S. Sourirajan and J. L. Blumenthal

CATALYSIS STUDIES FOR AIR POLLUTION CONTROL (PART II: CATALYTIC DECOMPOSITION OF NITRIC OXIDE PRESENT IN LOW CONCENTRATIONS). California Univ., Los Angeles, Dept. of Engineering. (Rept. No. 60-14.) Feb. 1960. 27 pp.

The results obtained on the decomposition of NO present in concentrations of 300-2100 ppm in diluent N2 in the presence of catalysts containing CoO or CuO at temperatures in the range 300-1000 C are reported. The catalysts were prepared either by decomposing the nitrate impregnated in the carrier or by precipitating the hydroxide on the carrier held in suspension in the nitrate solution. CuO deposited on silica gel was found to be the most effective catalyst for the decomposition of NO present in low concentrations. The efficiency of the carriers increased in the order kieselguhr (highest) alumina, silica gel (lowest). In the presence of CuO-SiO2 (30:70) catalyst using a gas space velocity of 1320/hr (measured at 25 C), the decomposition of NO (892 ppm) N2 was found to be 69% at 510 C. The above catalyst was found to maintain its effectiveness throughout the tested period of 300 hr even when exposed to temperatures of 1000 C several times. The use of the CuO-SiO2 (30:70) catalyst in conjunction with 700-1000 ppm of nitric oxide mixed with exhaust gases from a two cylinder engine leaded gasoline fuel was found to result in almost complete removal of nitric oxide at all temperatures above 350 C at a gas space velocity of 1000/hr measured at 25 C; no deterioration of the effectiveness of the catalyst was noticeable even after 100 hours of actual service with engine exhaust gases. (Author abstract)##

04200

P. E. Gartrell

CONTROL OF AIR POLLUTION FROM LARGE THERMAL POWER STATIONS. Rev. Soc. Roy. Belge Ingrs. Ind. (Brussels) (11) 471-82, Nov. 1966. (Presented at the Symposium on Air Pollution Control, Essen, Germany, Mar. 9, 1966 and at the Belgian Royal Society of Engineers and Industrialists Meeting, Brussels, Belgium, Mar. 16, 1966.)

Measures for the removal of particulates from stack gases and reductions in SO2 emissions as well as the dispersion of emissions by high stacks and control by operational procedure are discussed. The results of air pollution monitoring near large power stations of the TVA are reviewed. Gas cleaning devices

have been perfected so that 99.5% of the original ash content of the coal may be removed, although costs increase rapidly above 95%. In the future, removal of 99.5% of ash may be necessary in some plants based on combined mechanical and electrostatic collectors. There is a trend toward using electrostatic precipitators alone because of the high draft losses with mechanical collectors. While there are a number of promising developments in the removal of SO2 from fossil fuels, the principal reliance for the next few years will have to be placed on dispersion from high stacks with possible supplementary operational controls. The height of TVA stacks varies from 150 to 800 ft, and tables are given of relationship between the maximum ground level SO2 concentration, stack height, and wind speed. Data are also given of the frequency of occurrence of various ground levels of SO2 in the area around the plants.##

04338

A. J. Haagen-Smit

REACTIONS OF SULFUR DIOXIDE AND OTHER AIR CONTAMINANTS IN THE ATMOSPHERE. Proc. Am. Power Conf. 26, 117-24, Apr. 1964. (Presented at the 26th Annual Meeting, American Power Conference, Chicago, Ill., Apr. 14-16, 1964.)

Chemical reactions of sulfur and nitrogen oxides in the atmosphere are discussed. Photochemical smog is described in regard to both its relationship to these oxides, and the reactions which give rise to plant damaging and eye irritating compounds. Measures for the control of photochemical smog are discussed.##

04354

G. N. Radhakrishna

A STUDY OF THE REMOVAL OF NITROGEN OXIDES FROM AIR POLLUTING EXHAUSTS (For the Degree of Doctor of Philosophy, Purdue Univ.) June 1961. 205 pp.

Aiming to devise efficient methods of removing oxides of nitrogen from exhaust gases, hydroxide solutions and solids were experimentally studied. Nitrogen peroxide was selected as the typical oxide of nitrogen and was diluted with nitrogen. Dilute solutions of hydroxides (K, Na and Ca hydroxides) are effective as absorbents for oxides of N. The process of absorption involves formation of nitrous and nitric acids which are neutralized by the hydroxides. When alkalinity is in excess, nitrite and nitrate are formed in almost equimolar proportions. When the alkalinity is completely utilized, the nitrite is decomposed to form nitrate and NO. At the concentrations of NO2 and the flow rates for gases used, Ca and Na hydroxides are more effective absorbents than KOH. Ca(OH)2 is more effective as an acid neutralizing agent than NaOH and KOH and the ability to neutralize acid decreases

in that order. The removal of nitrogen peroxide by Ascarite increases with concentration of the gas and decreases with increasing flow rates, possibly due to the decrease in contact time. The removal of nitrogen peroxide by silica gel increases with the partial pressure as well as the concentration of the gas. At concentrations of nitrogen peroxide less than 0.79 mole per cent, removals by silica gel are much higher than those by Ascarite. But, at concentrations above 0.79 mole per cent, removals by Ascarite are higher than those by silica gel. The removals of nitrogen peroxide by calcium and barium oxides in dry condition are rather poor.##

04374

K. Yamazaki and Nenryo Kyokaishi

EXHAUST CONTROLS FOR AIR POLLUTION. (J. Fuel Soc. Japan Tokyo) 44, (460) 564-74, Aug. 1965. Jap.

Principal differences in the burning mechanisms of premixed and diffusion flames are discussed in relation to carbon or soot formation in order to elucidate the nature of exhaust from gasoline or diesel engine vehicles. The contents of exhaust pollutants (carbon monoxide, nitrogen oxide, hydrocarbons and their incomplete combustion products) vary extensively according to the driving mode of vehicle operation, as in idling, acceleration, cruising and deceleration. It is important to note that hydrocarbon emission is extremely remarkable in the deceleration step. Diesel exhaust is rather clean compared to gasoline exhaust. Exhaust control devices, catalytic and afterburner, developed in America are briefly reviewed. Improvement of the engine itself in order to reduce incomplete combustion is discussed. American estimations of future hydrocarbon emission under exhaust controls are cited. (Author summary)##

04417

AUTO EXHAUST STANDARDS WILL TIGHTEN. Chem. Eng. News 44, (20) 56-8, May 16, 1966.

Stricter standards regarding automobile exhausts are being sought, necessitating a more sophisticated approach to control systems by auto manufacturers. It is conjectured that controls based on reactive hydrocarbons, rather than total hydrocarbons, are likely. Many laboratories are presently assembling data on the reactivity of various hydrocarbons, but much more is needed. The continuing work on the modification of engines to reduce the emission of undesirable exhaust products is described. The need for standards regarding the emission of nitrogen oxides is controversial. However, research is proceeding on possible ways to control nitrogen oxides, concentrating primarily on catalytic systems. A diagram illustrating the formation of photochemical smog is included.##

04592

J. T. Middleton

AIR CONSERVATION AND THE PROTECTION OF OUR NATURAL RESOURCES. Proc. Natl. Conf. Air Pollution, Washington, D.C., 1962. pp. 166-71. 1963.

The importance and protection of air resources and factors affecting nature and extent of air pollution are discussed. Two aspects of control of air pollution are outlined. One is control at the source and the other is control through proper planning in the development of communities.##

04599

R. L. Chass

THE STATUS OF ENGINEERING KNOWLEDGE FOR THE CONTROL OF AIR POLLUTION. Proc. Natl. Conf. Air Pollution, Washington, D. C., 1962. pp. 272-80. 1963.

Control programs are discussed and particular the control program of Los Angeles County, also its demography, urban growth which is paralelled by increase in automobiles. Los Angeles, in spite of stringent air pollution regulations, has continued to increase its industries and to expand existing industries. In spite of the growth pattern, the engineering and enforcement functions of the District have resulted in preventing 4,500 tons of air contaminants from stationary sources, from entering the Los Angeles atmosphere each day. As it is pointed out in this paper, the air pollution problems can be solved, using sound technical and engineering approaches coupled with enlightened administrative and legislative action.##

04618

R. A. Baker and R. C. Doerr

CATALYZED NITRIC OXIDE REDUCTION WITH CARBON MONOXIDE. Ind. Eng. Chem. Process Design Develcp. 4, (2) 188-91, Apr. 1965. (Presented before the Division of Water and Waste Chemistry, 147th Meeting, American Chemical b8society, Philadelphia, Pa., Apr. 1964.)

The reductionof nitric oxide by carbon monoxide over a copper chromite catalyst frcm 115 to 270 C. and up to 1/36,000 hr. space velocity is discussed. Reduction of 90% at space velocities of 1/16,000 hr. is obtained at temperatures exceeding 200 C. At a given space velocity stepwise NO reduction is cbserved as a function of temperature. Partial reduction of NO to N2O takes place at low temperatures, follcwed by complete reduction to N2 as temperature increases. At 1/12,000 hr. inlet NO concentrations between 500 and 9000 p.p.m. do not effect reduction

efficiency at temperatures exceeding 150 C. Excess CO has no effect. Water does not affect NO reduction but leads to ammonia formation. Oxygen if present preferentially oxidizes CO to CO2. There must be sufficient CO to react with the O2 as well as NO for effective reduction of the NO. This system has practical significance for NO removal from automobile exhaust. (Author abstract)##

04634

T. P. Varshavskii, A. M. Denisov, L. E. Zlatin, and K. V. Zolotarev

SMOKELESS CHARGING OF COKE OVENS. Coke Chem. (USSR) (English Transl.) (6) 26-31, 1965. Russ. (Tr.)

A pilot-commercial smokeless charging plant has been built on No. 1 battery at the Kemerovo Coke and Chemical Works along the lines of those at VUKhIN and the Magnitogorsk Integrated Iron and Steel Works. A new smokeless oven charging system has been devised and introduced on the No. 1 battery at the Kemerovo Coke and Chemical Works based on separate consecutive emptying of the charging-car hoppers (4,3,2 and 1) with suction of the charging gases only into the coke side collecting main. The possibility of the saleable tar being contaminated with ash or heavy tar products has been eliminated. 4.0 tons/day of high-ash tar was obtained from the coke side collecting main. The nitric oxide content of the raw gas from No. 1 battery is 16.5 cc/cu meter. Accordingly it is vital to solve the problem of how to remove the nitric oxide from the charging gases or how to isolate and utilize them without purification. The satisfactory operating results of the plant enable this system to be recommended for works which do not supply gas to nitrogenous fertilizer undertakings. (Author conclusions)#

04636

A. Bouville and J. Fontan

CAPACITY OF FIBROUS PAPER FILTERS TO RETAIN SMALL ATMOSPHERIC RADIOACTIVE IONS. (Sur le Pouvoir de Retention des Filtres a Fibres de Papier pour les Petits Ions Radioactifs de l'Air.) J. Mecan. Phys. Atmosphere (Paris) 6, (21) 9-11, May 1964. Fr.

The efficiency of the Schneider-Poelman fibrous paper filters is reported for radon descendants. In the filtered air of a disintegration chamber for the dosage of radioactive gases, there is no possibility of the ions formed being absorbed on large aerosols. The diameter of the ions formed is in the order of 15 A. The efficiency of the Schneider-Poelman filters is better for ions than for larger aerosols. This agrees with the theory that predicts that filtration efficiency increases below 0.1 micron. It is not necessary for the ions to be absorbed on large aerosols to permit capture and measurement.##

04659

POLLUTION BY EXHAUST: U.S. LAW AND A U.K. SYSTEM. Engineering (London) 203, (5260) 213-6, Feb. 10, 1967.

A British system for the control of toxic exhaust emissions which is inexpensive promises excellent results and minimum power loss. It is emphasized that California's problem with photochemical smog and the meteorological conditions which result in the continual recirculation of the air are extremely rare in Europe. bBcarbon monoxide is considered the more serious problem. There has been a suggestion that the Los Angeles atmosphere be analyzed before and after a two-day ban on motor-cars to determine just how much pollution is caused by car exhaust. A very important contribution can be made by the Duplix induction system which employs a hot spot to assist vaporization in the manifold during part-throttle conditions only. The Zenith Duplex system vaporizes the fuel in a by-pass or primary manifold during idling, part-throttle, and over-run when emissions are at a maximum. At the same time, the primary manifold is inoperative at full throttle, so maximum power is virtually unaffected. Charts are given representing the California regulations based on cold starting, idling, accelerating, and stopping to resemble normal city driving. A typical emission trace is given showing hydrocarbon emission from a standard 1200 cc engine during deceleration, acceleration, cruising, and idling. The emission with the Duplex induction system was 377 ppm of hydrocarbons with only a minor peak at maximum depression compared to 1638 ppm of hydrocarbons with severe peaks during deceleration.##

04838

F. D. Reed

CONTROLLED ENDO-EXOTHERMIC OXIDATION OF INDUSTRIAL WASTES. Pre- (Presented at the Oklahoma State Univ. Conference on Industrial Wastes, Stillwater, Nov. 16, 1965.)

Time, temperature, and turbulence are factors in disposal by oxidation. The deciding factor for design temperature is the proximity of molecules of fuel to molecules of oxygen. Complete combustion, as defined by the author, does not exist if 500 ppm of the toxic or noxious material is in the flue gases. Average target concentration at grade and downwind of the stack is in the order of 0.10 ppm or perhaps less. The concentrations of substances which will cause odor nuisance are restated. The residence time factor must provide for the time interval required for conversion of the liquid to the gaseous state. In disposal of liquid streams and when mineral salts are present, the mineral exits from the furnace in the form of its oxide in sub-micron size particles.##

04934

Neiburger, M.

METEOROLOGICAL ASPECTS OF AIR POLLUTION CONTROL. Reprinted from Yale Sci. Mag., Jan. 1967.

Everywhere in the United States (and elsewhere in the world) where pollution enters the atmosphere it is carried with the wind from city to city and state to state. Thus the control of pollution cannot be carried on exclusively on a local community or even a regional basis. States, the federal government, and even international agencies must act. In the consideration of the kinds of control and the relative roles of the various governmental levels, various meteorological factors, such as vertical temperature gradient and wind velocity, are involved besides the wind transport. These factors determine the rate of diffusion of pollutants, and thus the concentrations of contaminants in the air, given the location and intensity of the sources. Meteorological factors influence the rate of oxidation of sulfur dioxide, the rate at which SO3 picks up water to form sulfuric acid droplets, etc. Meteorological factors control the rate at which pollutants are removed from the air.##

04962

R. G. Lunche, E. E. Lemke, R. I. Weimer, and J. A. Verssen

AIR POLLUTION ENGINEERING IN LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif. July 1, 1966. 51 pp.

Los Angeles County, the largest heavily-industrialized, semi-tropical area in the world, is afflicted with a serious and well-publicized air pollution problem. This problem is accentuated by average wind speeds of less than 6 miles per hr., and temperature inversions on more than 260 days per year, which restrict dispersion of the air contaminants generated by the activities of seven million people. Since 1939 population has more than doubled, industry has expanded from approximately 6000 establishments to more than 20,000 in 1966, and automobile registration, gasoline consumption and fuels usage have increased sharply. In addition to nearly two decades of expenditures by the District for research engineering and enforcement, industry has expended during this same period 127 million dollars for the installation of new control equipment units and 882 million dollars for basic production equipment. This program is preventing some 5085 tons of various air contaminants from entering the Los Angeles atmosphere each day. Of this total, control measures of the petroleum industry are responsible for removing some 3425 tons. The prohibition of burning of high sulfur fuels accounts for another 535 tons. The ban on single chamber incinerators and open burning prevents another 605 tons from entering the atmosphere. The control of air contaminants from mineral and metallurgical industries accounts for another 420 tons. Of the 5085 tons of

various air contaminants now prevented from entering the Los Angeles atmosphere from staticnary sources each day, 1195 tons are hydrocarbons, 1320 tons are SO2, 1945 tons are CO, 470 tons are aerosols, and 155 tons are oxides of nitrogen. The program will not be complete however, until effective control over the gasoline-powered vehicle, fuel oil burning and organic solvent usage is carried out.**

05048

G. H. Peters, J. E. Aker, and E. F. Morello

A SOLID CHEMICAL AIR GENERATOR. Amoco Chemicals Corp., Seymour, Ind., Propellants Div. (Rept. No. AMRL-TDR-64-71.) Sept. 1964. 55 pp.

The development of a solid chemical air generator capable of producing a breathable, oxygen enriched atmosphere for possible space applications was investigated. The direct decomposition of solid ammonium nitrate to produce the desired atmosphere was studied. This direct method of conversion was found to be impractical as the reaction products consisted of nitrogen oxides regardless of the conditions of decompostion. Various catalyst systems for decomposition of nitrous oxide were investigated since the reaction products contained about 40% of this gas and results indicated this gas could be controlled. Screening of various catalyst systems produced nickel oxide, 0.5% rhodium on alumina, 0.6% platinum on alumina, and cobalt oxide catalysts - all capable of completely decomposing nitrous oxide at high flow rates. The level of nitrous oxide in the reaction products could not be increased sufficiently to provide the desired oxygen level, and it was necessary to decompose the nitrogen dioxide present in the reaction gases. Catalyst systems based on barium oxide and sodium silicate were developed which decomposed pure nitrogen dioxide but were found to be partially deactivated by water formed in the ammonium nitrate decomposition. The oxygen level in the gas was increased to approximately 12% (36% of theoretical). A compact unit was developed that was capable of decomposing solid ammonium nitrate at a controlled rate on demand and partially converting the gases to provide an atmosphere containing about 12% oxygen.**

05082

TWO MECHANICAL DEVICES ATTACK THE CAUSES OF SMOG. Prod. Engr. 38, (6) 22-4, Mar. 15, 1967.

The problem of polluted air in most metropolitan areas is the result of automotive exhaust products. The development of 2 new mechanical rather than catalytic smog control devices are the nitric oxide reduction system, NCR, which meters the exhaust from a car engine and recycles it for further combustion, and vehicle vapor recovery system to prevent unburned gasoline from escaping by evaporation. The new devices reduce or eliminate the emissions. Company tests, nitric oxide reduction system, and the vehicle vapor recovery system are discussed.**

05149

W. F. Hamilton, M. Levine, and E. Simon

SMOG ABATEMENT. Lockheed Aircraft Corp., Burbank, Calif. (Dec. 1, 1959). 48 pp. (Rept. No. 14163.)

Techniques were developed for simulating typical smog polluted atmospheres. Methods and materials for reducing or preventing smog formation as measured by ozone level were studied. Several classes of materials were found effective in various degrees. Best results were obtained by direct addition of iodine to polluted atmospheres. Additions were effective both prior to smog generation by irradiation or after smog formation occurred. Attempts to introduce inhibiting materials in gasoline through an internal combustion engine were unsuccessful. (Author abstract modified) ##

051511

E. A. Kerns

CHEMICAL SUPPRESSION OF NITROGEN OXIDES. Westinghouse Electric Corp., Pittsburgh, Pa., Headquarters Mfg. Lab. (1964). 6 pp.

An approach to NO and NO2 fume control by eliminating the fumes before their release from pickling, milling and bright dipping solutions was investigated. Since classical chemistry shows a reaction between most primary amines and the oxides of nitrogen, a study of an available, inexpensive, and readily adaptable amide, urea, was undertaken. The investigations included a thorough study of the urea-nitric acid-nitrogen oxides reactions for both copper and iron-68 analyses of the urea (for purity), and of the evolved gases; and the effect of the urea-nitric acid system on the various types of stainless steels and other metals which could be employed. A thorough study of the possible hazards of the urea-nitric acid system was undertaken also . In the case of chemical milling urea sucessfully lowered the NO2 fumes to almost undetectable levels, but this treatment did not suppress the HNO3 vapors which coincidentally are released from these hot chemical milling solutions. Thus a small water scrubbing apparatus is still required to prevent these vapors from being released to the atmosphere. The use of a HNO3-urea solution system produces a satin finish in less than half of the time now required to bright dip and release no toxic fumes to the atmosphere.##

05250L

K. Nobe, and M. A. Accomazzo

CATALYTIC COMBUSTION OF HYDROCARBONS WITH COPPER OXIDE. I. Methane, Ethane, and Propane. California Univ.,Los Angeles, Dept. of Engineering. (Rept. No. 61-83.) Dec. 1961. 39 pp.

The catalytic combustion of hydrocarbons present in low concentrations is of particular interest in the search for methods to control air pollution. The results are reported of the heterogeneous oxidation of methane, ethane and propane with a CuO-Al203 (1:1) catalyst with a BET surface area of 120 sq m/gm and a mean pore radius of 65A. The combustion was studied at initial hydrocarbon concentrations in the range 650 to 5,000 p.p.m., in the temperature range 313 to 591 C and gas space velocities 6,000/hr. The hydrocarbon concentrations were measured with a Carad flame ionization analyzer and detector. The experimental results showed that for gas space velocities up to 10,000/hr., 90% combustion was attained at temperatures above 580 C, 500 C and 480 C for methane, ethane and propane, respectively. The results indicated that the degree of hydrocarbon oxidation increased with increase in chain length. The experimental kinetic data was found to fit empirical rate equations which were one, three-fourths, and three-fifths order with respect to methane, ethane and propane concentrations respectively.

05300

Iodwick, J. R.

CHEMICAL ADDITIVES IN PETROLEUM FUELS: SOME USES AND ACTION MECHANISMS. J. Inst. Petrol. (London) 50, (491) 297-308, Nov. 1964. (Presented at the Northern Branch Symposium, Manchester, England, Apr. 23, 1964.)

The paper enumerates the types of anti-oxidants, copper deactivators, corrosion inhibitors, combustion chamber modifiers, anti-icing compounds, anti-knock agents, and anti-static additives in current use or proposed for use in the near future. Where possible the action mechanisms whereby these additives operate have been given and discussed. (Author summary)

05309

E. C. Betz and H. J. Feist

CATALYTIC AFTERBURNING OF ORGANIC AIR POLLUTANTS. Technik (Berlin) 20 (6), 395-400 (June 1965). Ger. (Tr.)

Newly developed all-metal catalysts are discussed which are designed on the basis of the building block assembly system; in practice, they achieve an average running time of 25,000-35,000 working hours. A catalyst, which speeds up a reaction because of its presence, without itself participating in the reaction, reduces the decomposition temperature during combustion. A reaction temperature of 250-350 C was achieved with all-metal catalysts developed for catalytic exhaust gas purification. The cold exhaust gases flow through a heat exchanger and are preheated. Then they are heated by means of oil burners, gas burners, or electrical heating elements until they reach the catalytic reaction temperature. A fan then moves the exhaust gases to the

catalyst where the irritants are oxidized. The heat released during catalytic combustion is largely recovered in the heat exchanger and it is used for heating the cold exhaust gases as combustion here is exothermal. At a reaction temperature of about 250-350 C, all combustible components are oxidized in the exhaust gas. As a result of the temperature increase in the exhaust gas in the catalyst, the positive heat change of this reaction can measured which gives a figure directly proportional to the irritant concentration. The catalytic exhaust gas purification unit thus serves as a measurement instrument for the concentration of the exhaust gas. A measurement system used for continual surveillance is presented in diagram. Applications of catalytic afterburning are discussed in relation to the following: drying and hardening processes, phthalic acid and maleic acid anhydride production, nitric acid production, NO/NO2 reduction.##

05323

Jackson, Marvin W.

EFFECTS OF SOME ENGINE VARIABLES AND CONTROL SYSTEMS ON COMPOSITION AND REACTIVITY OF EXHAUST HYDROCARBONS. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., N. Y., 1966, P.
N. Y., 1966, p. 241-267. ((41)) refs. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Detroit, Mich., June 3-10, 1966.)

The effects of air-fuel ratio, spark timing, an engine modification system, and the Air Injection Reactor System on the composition and reactivity of the exhaust hydrocarbons are reported. The reactivity index and composition changes are compared to those indicated by the nondispersive infrared analyzer. Either retarding the spark timing or leaning the air-fuel ratio reduced the hydrocarbon concentration measured by the infrared analyzer. In contrast, the reactivity index increased as the spark timing was retarded and the decrease in the reactivity index due to leaning the air-fuel ratio was only 1/2 the decrease in the concentration measured by the infrared analyzer. For equal reductions in the concentration measured by the infrared analyzer, the reactivity index with the engine modification system was 37% higher than that with the Air Injection Reactor System. Conversely, in order to produce an exhaust with the same level of reactivity, the engine modification system has to reduce the concentration measured by the infrared analyzer about 70 ppm n-hexane more than the Air Injection Reactor System. The use of the reactivity index points out significant differences in smog-forming potential resulting from both changes in engine design variables and exhaust control systems; these differences are not revealed by measurements made using the infrared analyzer. (Author"s abstract)##

05401

ATMOSPHERIC EMISSIONS FROM NITRIC ACID MANUFACTURING PROCESSES. Public Health Service, Cincinnati, Ohio, Div. of Air

Pollution and Manufacturing Chemists Association, Washington, D.C. 1966. 96 pp. (999-AP-27.)

Emissions to the atmosphere from the manufacture of nitric acid were investigated jointly by the Manufacturing Chemists' Assoc., Inc. and the U.S.P.H.S.; the study was the second in a cooperative program for evaluation of emissions from selected chemical manufacturing processes. The report describes the growth and potential of the nitric acid industry, the principal processes for production of nitric acid, process variables, emissions from plants under normal operating conditions, and the methods and devices used to limit and control emissions. The sampling and analytical techniques by which emissions were assessed are presented in detail. (Author's abstract)##

C5430

B. Andoh

HITACHI AIR CLEANER. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., tokyo) 4(3):9-17, 1966. Jap.

Hitachi long-term highly efficient filters (having a dust-collecting efficiency of over 99.97%) have been used especially in the pretreatment of air. The characteristic common to the Hitachi cleaners is the use of a multiple ion-radiation system in the ionization unit. The charing efficiency is increased by reducing the spreading angle of corona of ion irradiation by using subelectrodes without increasing the coronal electric current. The unit exhibits high efficiency, uses low electric power, and thus does not generate ozone. Silicone rectifiers are used and entire parts are dipped in oil, thus giving the high-voltage electric source a semi-permanent life time. The safety device permits high-voltage charging parts of the equipment to be grounded whenever any door of the cabinet may be opened. Various ways of washing away accumulated dusts are also described.##

05471

J. Oliver

THE PAINT FINISHER AND AIR POLLUTION. Prod. Finishing (Cincinnati) pp. 62-9. Apr. 1967.

Rule 66 adopted by Los Angeles County, July 28, 1966 requiring tighter control of the 550 tons of solvent capor discharged daily appears to be a precursor of regulatory action in other areas. The rule was based on smog chamber tests of the photochemical reactivity of various solvent vapors. Rule 66 prohibits the discharge of more than 15 pounds of organic material into the atmosphere daily from heat-cured, baked, or heat-polymerized material unless all organic material has been reduced 85% or to not more than 15 pounds daily. With air-drying finishes containing no photochemically reactive solvents

there are no restrictions. Control measures include a greater use of water - based coatings and the substitution of a mixture of oxygenated solvents and aliphatic hydrocarbons for aromatic solvents. Where formulation changes do not control the exhausts from spray booths or baking ovens, alternative controls include absorption, liquid scrubbing, incineration, and catalytic combustion. Substantial tax benefits are under consideration in some states for companies installing pollution-abatement equipment.##

05857

D. H. Barnhart and E. K. Diehl

CONTROL OF NITROGEN OXIDES IN BOILER FLUE GASES BY TWO-STAGE COMBUSTION. J. Air Pollution Control Assoc. 10 (5), 397-406 (Oct. 1960). (Presente at the 52nd Annual Meeting, Air Pollution Control Association, Los Angeles, Calif., June 21-26, 1959.)

Two-Stage Combustion with auxiliary-air ports above the burners is an effective method for controlling the nitric oxide concentration in boiler flue gases while still maintaining acceptable boiler performance. While utilizing this method of operation, with 95% of the combustion air through the burners, the nitric oxide level was reduced nearly 30% with both oil and gas firing. A reduction of 47% occurred during full-load oil firing when the air flow through the burners was 90%. The principal gains made in bringing nitric oxide under control are summarized. Two-Stage Combustion together with minor changes to the burner (approach-cone vanes out and air registers wide open) has given a total nitric oxide reduction of 56% when firing oil at full load. As mentioned previously, similar results can be expected in gas firing. It appears that additional reductions in nitric oxide would be possible if the air flow through the burners were reduced another 5 or 10%. The limit would be reached when combustibles (carbon, CO, etc.) were detected at the furnace outlet, or when the burners became unstable. The Southern California Edison Company put the Two-Stage Combustion Method into extended test operation at their El Segundo Steam Station. Although the fuel-air mixing process requires careful balance between rapid mixing for best combustion, and delayed mixing for nitric oxide reduction, the change has not required expensive equipment nor has it involved any extensive alterations to the boiler. This method of burning has also been incorporated in the design of two new boilers for Edison's Mandalay Station and two for their Huntington Beach Station. Two-Stage Combustion is believed to be a practical operating method for the control of nitric oxide emission from large gas- or oil-fired boilers. (Author summary modified)##

05867

A. A. Atkisson, Jr.

NATIONAL MOTOR VEHICLE CONTAMINANT CONTROL REQUIREMENTS. J. Air Pollution Control Assoc. 12 (5), 234-42 (May 1962).

(Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

An attempt has been made to determine the probable existing and future vehicular pollution problems in the nation, as contrasted to the problems which actually have occurred in Los Angeles County and other areas of the State of California. In the 14 metropolitan areas examined in this study, the data strongly suggest that atmospheric burdens of vehicular contaminants now have reached the critical levels necessary for the occurrence of photochemical smog episodes. Since approximately 20% of total vehicular hydrocarbon emissions are derived from crankcase or "blowby" losses, the potential national vehicular contaminant problem can be substantially minimized by the adoption of blowby control programs. The county of Los Angeles and other agencies have performed tests on a variety of blowby control devices and have shown that a virtual 100% control of blowby losses can be achieved at a cost ranging from six to 18 dollars per vehicle. These studies also have shown that no adverse maintenance or operational conditions result from the use of such devices.##

05894

N. A. Richardson and W. C. Middleton

EVALUATION OF FILTERS FOR REMOVING IRRITANTS FROM POLLUTED AIR. Heating, Piping, Air Conditioning 30, 147-54 (Nov. 1958). (Presented at the Meeting of the Chapters Regional Committee for Region 4, American Society of Heating and Air Conditioning Engineers, Los Angeles, Calif., May 6, 1958.)

Two air-filter media were evaluated by their effectiveness in reducing human sensory irritation resulting from Los Angeles smog. The sensory response of one group of subjects working in a filtered atmosphere was compared with the response of another similar group working in a non-filtered atmosphere in identical, adjacent rooms. Sensory response was measured daily and simultaneous measurements of the physical composition of the air were obtained. Much of the testing was with activated carbon filters varying in air detention time between 0.032 and 0.0030 sec. A significant decrease in irritation was recorded over the entire range of air detention times. Differences in effectiveness with respect to air detention time were not statistically significant, although a trend of decreasing effectiveness was observed as air detention time was reduced. Effectiveness of activated carbon in removing oxidants was directly related to detention time. NO2 was reduced by activated carbon during its early use. A particulate filter which effectively removes particles having a diameter less than 0.05 microns was also tested. No decrease in sensory irritation was detected. Correlations computed between measurements taken in the non-filtered atmosphere indicate that sensory irritation is highly related to oxidant level and moderately to temperature. (Author's summary)##

05968

N. A. Richardson, W. C. Middleton, J. D. Isherwood, and E. Junge

AN INVESTIGATION OF SYSTEMS FOR REMOVING IRRITANTS FROM POLLUTED AIR. (In: First report of air pollution studies.) ((California Univ., Los Angeles, Dept. of Engineering.)) (Rept. No. 55-27.) (July 1955). 34 pp.

A study has been initiated to determine the effectiveness of various types and combinations of filtering devices for removing the irritants from polluted air. Because the irritants in "smog" have not been identified, the performance of these systems will have to be evaluated directly in terms of human response. For this purpose, a questionnaire which assesses human sensory response to an air environment has been designed and tested. Filter effectiveness can be evaluated by measuring the sensory response of a group of test subjects to a filtered environment and comparing it to the sensory response which the same test group would exhibit in the absence of the filtering unit. The latter response must be ascertained by measuring the concentration of certain selected chemical substances at the filtering system inlet and relying upon a correlation between group response and the concentration of these chemical "indicators." The sensory response of three test groups to an unfiltered air environment was being compared to several chemical and physical measurements in order to establish correlations for use in filter evaluation. Preliminary results suggest that oxidant concentration as measured by a phenolphthalein reaction may serve as a good "indicator" of the severity of "smog" irritation. (Author abstract modified)##

06105

G. W. P. Rengstorff

A RESEARCH APPROACH TO THE CONTROL OF EMISSIONS FROM STEELMAKING PROCESSES. J. Air Pollution Control Assoc. 13 (4), 170-2 (Apr. 1963). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

A number of studies have contributed toward an understanding of the iron-oxide-smoke forming processes. One of the most interesting methods of study has been the use of very highspeed photography to observe formation of iron-oxide smoke and the metal bath under various conditions. The motion pictures obtained in this study are discussed. The mechanism which now seems most acceptable proposes that metallic iron is vaporized from an essentially clean surface of liquid metal. This iron vapor reacts with incoming gas which is at least slightly oxidizing and forms FeO. The compound FeO is insoluble in the gas (it has a low vapor pressure) and condenses as fine droplets. This depletes the iron vapor in the vicinity of the liquid iron, so more iron is vaporized in an effort to maintain an equilibrium pressure

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of iron vapor. Thus, a continuous pumping action is maintained for the formation of iron oxide smoke so long as oxidizing gases are being supplied and the surface of liquid iron is clean enough for iron vapor to form. Elimination of smoke at low carbon contents in top blowing is probably the result of suppression of vaporization of iron. Under other steelmaking conditions, it may be the result of providing a reducing atmosphere at the surface of the metal, by cutting off the supply of oxidizing gases such as carbon dioxide. One suggestion for explaining the elimination of vaporization of iron at low carbon comes from the pictorial observation of metal dynamics. When bubbles of CO are no longer breaking at the surface to expose clean liquid iron, smoke formation stops. An alternative is that the metal is no longer able to provide carbon at the surface where oxygen impinges on it fast enough to prevent the formation of protective higher iron oxides.##

06144

Hirao, O.

PROBLEMS OF AIR POLLUTION DUE TO VEHICLE EMISSIONS GASES. J. Japan Soc. Mech. Engrs. (Tokyo) 69,575, 1568-72, Dec. 1966. Jap.

The reduction of air pollution due to automotive exhaust is estimated to cost the Japanese tax payer $42 million. Likewise, a great expense will be incurred in correcting pollution from steam power plants. Automobile exhaust causes pollution in local areas such as heavy traffic circles. The harmful effects of such pollutants as CO, SO2, NO, hydrocarbonds, formaldehyde, and dusts are discussed, expecially pollution due to CO. A supplement of secondary air to convert CO to CO2, and the even distribution of gases to the cylinders would be useful in cutting pollution. The production of various hydrocarbons by the engine is tabulated. Another possible method for lessening the concentration of automotive emissions would be in construction of over- and under-passes to avoid bottlenecks on the highway. This method would be cheaper than design and installation of engine modifications for each car. For example, it is estimated that it would cost $900 million per year for cars in the United States to be properly equipped to control automotive emissions, which money could more favorably be used in carefully designed construction of 3000 miles of highway.

06265

A. P. Krueger, J. C. Beckett, P. C. Andriese, and S. Kotaka

STUDIES ON THE EFFECTS OF GASEOUS IONS ON PLANT GROWTH. (II. THE CONSTRUCTION AND OPERATION OF AN AIR PURIFICATION UNIT FOR USE IN STUDIES ON THE BIOLOGICAL EFFECTS OF GASEOUS IONS). (J. Gen. Physiol.) 45(5), 897-904 (May 1962).

Air pollutants seriously interfere with the maintenance of unipolar ionized atmospheres required in experimenting with the

biological effects of gaseous ions. The construction and operation of an air purification unit designed to reduce air pollution to tolerable levels are described; it has functioned satisfactorily in conducting experiments with plants and animals.##

06534

L. A. Chambers

GASOLINE COMPOSITION AS A FACTOR IN AIR POLLUTION. Preprint. (Presented at the American Chemical Society Meeting, Atlantic City, N.J., Sept. 16, 1959.)

The evidence accumulated by the Air Pollution Control District of Los Angeles for modifying gasoline composition as a means of reducing the formation of smog was illustrated. Studies were made with exhaust from engine operations using fuels of high, very low and intermediate olefin content. The evidence included correlations between the following: Relationships between fuel composition and eye irritation; gasoline composition to exhaust composition; fuel olefins to plant damage; gasoline composition to aerosol formation; and gasoline compositions to ozone, aldehyde, and other intermediate formations. No fully adequate conclusion as to the explicit relationship between gasoline composition and smog can be formulated at present. It is evident that fuel constituents influence the smog forming properties of exhausts and that certain blends of gasoline are superior to others in this respect.##

06688

W. S. Sease and G. F. Connell

PUT OZONE TO WORK TREATING PLANT WASTE WATER. Plant Eng. 20 (11), 126-7 (Nov. 1966).

Ozone is an extremely versatile chemical used for water treatment, and waste, odor and air pollution control. In natural states it occurs in concentrations of 0.01 - 0.02 ppm by volume. Of all the methods of commercial production, corona discharge is the most successful technique for industrial application. In generating ozone, a minimum voltage of 1500V is impressed upon a conductor. Between conductor and ground, there is a non-conductor and an air gap. The corona discharge occurs in this gap. Concentrations of 1% by weight, or 6000 ppm by volume can be produced on a consistent and practical basis. Ozone, as an oxidizing agent, purifies water from organic matter, bacteria and viruses and facilitates filtering of solvable ferrous and manganese salts. In waste treatment plants which employ primary and secondary systems for waste removal, ozone provides the tertiary or final polishing treatment of the effluent. Properly handled, toxicity of ozone presents no greater problem than any normal compressor or motor.##

06714

ELECTROSTATIC FORCES. Text in French. J. Equipment Electrique Electronique, No. 201:77-85, 1960. Engl. transl., Technical Documents Liaison Office, MCLTD, Wright-Patterson AFB, Ohio, MCL-1206/1+2, 17p., Sept. 13, 1961.
DDC: AD 268876

Information, taken from reports presented at the International Conference of Grenoble, on practical applications of electrostatic forces is given. Industrial applications of electrostatic forces have been classified into four groups: (1) Capturing permits in particular the treatment of industrial gases and removal of dust from them, and the purification of air. (2) Depositing applies to electrostatic painting and to the treatment of plants. It also applies to the manufacturing of abrasive paper and cloth, to flocking of the surface of various objects, to powdering sheets of metal, and to the manufacture of flucrescent tubes; also in xerography, enamelling, metallization, lubrication of laminated steel, smoking of certain food products, and especially the treatment of cereal grains with insecticides before storing. (3) Extracting is known for its application to the draining of paint in installaticns fcr drip painting; and (4) Separating consists chiefly of sorting minerals, and sorting mixtures of sand and grains of steel coming from ingots. The most instructive applications are described.##

06778

(INDUSTRY AND ATMOSPHERIC POLLUTICN IN GREAT BRITAIN.) Industrie et pollution atmospherique en Grande Bretagne. Centre Interprofessionnel Technique d'Etudes de la Pollution Atmospherique, Paris, France. (1967.) 6 pp. Fr. (Rept. No. CI 310.) (C.I.T.E.P.A. Document No. 24.)

A summary of the basis of governmental acticn in Great Britain in the struggle against industrial emissions is outlined. The regulations imposed by the "Alkali Act" are in most cases based on "the most practical means." Standards are given for chimney heights. Statutory limits are given for various materials emitted such as hydrochloric acid, sulfuric acid, nitric acid, hydrogen sulfide, chlorine, arsenic, antimony, cadmium, and lead. The construction of tall buildings tends to reduce the benefits obtained by tall chimneys. A better knowledge of the effects of pollutants should be obtained so as not to burden industry with unnecessary expense in their control. It is urged that international standards for emission be adopted.##

06844

H. C. Anderson, P. L. Romeo and W. J. Green

A NEW FAMILY OF CATALYSTS FOR NITRIC ACID TAIL GASES. Engelhard Ind. Tech. Bull. 7 (3), 100-5 (Dec. 1966).

The palladium unitory ceramic catalyst remove oxides of nitrogen from tail gases produced during the production of nitric acid was evaluated. The new catalyst, provides excellent abatement at 100 p.s.i.g., using space velccities of 100,000. Even at 150,000, 94% of the NOx was removed, with ammonia in only slight excess over the NOx. Bench-scale and field experience have shown that the unitary ceramic catalyst is well adapted to the treatment of nitric acid stack gases.##

06867

M. T. Dmitriev

EFFECT OF IONIZING RADIATION ON THE COMPOSITION OF THE AIR WITHIN A FACTORY. (Vliyanie ioniziruyushchei radiatsii na sostav vozdukha proizvodstvennykh pomeshchenii.) Hyg. Sanit. (Gigiena i Sanit.) 30 (4), 44-50 (Apr. 1965). Russ. (Tr.)

A study was made of the efficiency of the processes leading to the production of nitrogen oxides and ozone in the air under the action of ionizing radiation and neutrons. A comparison of the data obtained with concentrations of nitrogen dioxide and ozone gases, formed in the air under natural conditions, made it possible to set the maximum permissible doses of ionizing radiation and that of the integral neutron current in the air of industrial premises. The following values of the permissible absorbed dose and the integral neutron flux were obtained 530 r and 1.0x10 to the 12th power neutr./cc for 03 and 70,000r and 1.3x10 to the 14th power neutr./cc for nitrogen oxides. These values for the maximum permissible absorbed doses and the integral neutron fluxes may be used as initial data for determining the capacity of ventilation installations in factories where the personnel are subjected ot irradiation. Safe entrance into the room after the termination of irradiation (when the radiation source has been automatically removed into a special well) will be ensured by a ventilation factor of 36 during the period of irradiation, at a typical mean dose rate of 10 r/sec. If the volume of the rocmsis, for example, 150 cu m, the rate of the removal of air should not be less than 1.5 cu m/sec.##

06877

A. I. Stezhenskii and O. A. Zagorovskii

POLLUTION OF THE URBAN ATMOSPHERE BY NITROGEN OXIDES. (K voprosu o zagryazenii atmosfery gorodov okislami azota.) Hyg. Sanit. (Gigiena i Sanit.) 30 (6), 408-10 (June 1965). Russ. (Tr.)

The emission of nitrogen oxides and a possible measure for reducing NO2 content in the flue gases discharged by the gas turbine were discussed. Nitrogen dioxide content in flue gas of different installations are compared and the highest NO2 content is found in combustion products discharged by the gas turbine.

The most practicable and efficient method for reducing the production of NO2 is the reduction of the cooling (quenching) rate of the combustion product by lengthening the gas line leading from the combustion chamber to the turbine and by a gradual feeding of secondary air through a series of holes arranged at uniform intervals along the entire length of the gas line.##

06967

PREVENTION OF AIR POLLUTION IN THE STATE OF NORTH RHINE-WESTPHALIA. Ministry of Labour and Social Welfare, North Rhine-Westphalia, Germany)). (Report to the Congrss on the "Prevention of Air Pollution", Duesseldorf, Germany, Apr. 5-7, 1965.) 78p. Translated from German.

A survey of the activities in North Rhine-Westphalia for the prevention of air pollution is reported and the results are summarized. The report included: (I) history, legal basis, administrative organization, smogwarning network, and economic problems; (II) Report of the Factory Inspection Dept. (Enterprises subject to approval and other enterprises and working places); and (III) report of the State Institute for Air Pollution Control and Land Utilization (monitoring of air pollution, techniques for measuring immissions, relationship between emission and immission, technical steps for the restriction of emissions, and the effect of air pollution on soil, vegetation and animals.##

07093

REVIEW OF RESTRICTING GAS EMISSION FROM NITRIC-ACID PLANTS. ((VDI (Verein Deutscher Ingenieure) Kommission Reinhaltung der Luft, Duesseldorf, Germany,)) (VDI No. 2295.) (July 1963) Ger. (Tr.) 12 pp.

The control of nitrogen oxides during the production of nitric acid was discussed. Nitrogen oxides emissions are restricted by absorption, suitable discharge outlets, and on the basis of imissions. Because of the particularities of nitrous gases, the content of the waste gases cannot be completely controlled.##

07121

Halliday, E. C.

ENGINEERING ASPECTS OF SMOG ABATEMENT. South African Council for Scientific and Industrial Research, Pretoria, RE-19, 13p., ((1960)). 6 refs. (Reprinted from the Eastern Province Soc. of Engineers J., 1960-1961.)

The current American abstracts indicate that over 600 papers are being published on air pollution each year, a high percentage of

them being concerned with engineering aspects of the reduction of concentration of pollution in the atmosphere. The topics discussed include: the pollutants and their sources, the effects of atmospheric pollution, the dissipation of pollutants in the atmosphere, the reduction of pollution, pollution from combustion, sulfur dioxide from combustion, and grit and dust arrestment in industry. Sutton's equation for the case of the emission of pollutants at a height above the ground is also discussed.##

07172

Collier, E. I., M. C. Gourdine, and D. H. Malcolm

ELECTROGASDYNAMICS AND PRECIPITATION. Ind. Eng. Chem., 58(12):26-29, Dec. 1966.

Electrogasdynamic (EGD) precipitation is discussed. Electrogasdynamics is concerned with the acceleration or deceleration of a flowing gas containing unipolar ions with the expenditure or extraction of electrical energy. The EGD precipitator consists of three basic components: an ionizing section, a dielectric section, and a collector section. The entrance to the precipitator is a high velocity duct in which the ionization of particulate matter occurs. The particles leave the ionizer through a dielectric section at approximately the same velocity and expand through a decelerating diffuser into a collector. The dielectric section separates and electrically insulates the collector from the ionizer and allows the buildup of a strong space-charge field. Repulsion of the particles, due to like charges, drives them to the walls of the collector where they are precipitated. The theory of space-charge collection, generators, and ion sources is reviewed. A precipitation system based upon electrogasdynamic principles is feasible. Performance levels comparable to those of conventional devices can be obtained in an installation of considerably lower capital cost. The geometry considered in the analysis was, for simplicity, cylindrical. However, a large scale installation would employ a rectangular plate construction similar to conventional precipitators, with the greatly increased plate separation that the space-charge collection system permits.##

07187

E. C. Larson and H. E. Sipple

LOS ANGELES RULE 66 AND EXEMPT SOLVENTS. J. Paint Technol. 39(508):258-264 (May 1967). (Presented at the Los Angeles Society for Coatings Technology, Calif., Oct. 12, 1966; at the Golden Gate Society, San Francisco, Calif., Oct. 17, 1966; and at the Portland, Seattle, abd Vancouver Sections of the Pacific Northwest Society, Washington, Oct. 19, 20, and 21, 1966.)

The implications of Rule 66 of the Los Angeles County Air Pollution Control District, which controls the emissions of volatile organic solvents, are reviewed for their effect on the

paint industry. The various provisions of Rule 66 are discussed to illustrate the desirability of using exempt solvents. Saturated hydrocarbons (iso, normal, and cycloparaffins), alcohols, esters, ether-alcohols, and non-branched ketones are entirely exempt. The exempt limits for photochemical reactive materials are as follows: olefins - 5%, C8 plus aromatics - 8%, and toluene, ethylbenzene, branched ketones, and trichloroethylene - 20%. With mixtures of these photochemical reactives the total allowable amount is 20%. The problem facing the paint industry is the replacement of the aromatic solvents which are good solvents, but are photochemically reactive. (igh solvency napthenic base stocks will help offset the solvency of the displaced aromatics for the long oil alkyds and many medium oil alkyds. Small quantities of non-exempt solvents can be used provided the escaping vapors are condensed or burned efficiently. The General Services Administration has asked for a revision of all their purchasing specifications to conform to Rule 66.##

07199

S. Yoshinari

ELECTROSTATIC AIR FILTER. Kuki Seijo (Clean Air - J. Japan. Air Cleaning Assoc., Tokyo) 1(1):70-71, 1964. Jap.

Electrostatic air filters are divided into twc groups: the 2-step charging type and the dielectric filter type. Under the charge type come the automatic flush type, automatic washing type, and exchange filter type. The dielectric filter type gives a charge to the filter which has a high dieletric constant in order to promote efficiency. This type of filter does not produce much ozone. In the two-step charging type the air resistance is very small during the operation and the collecting efficiency largely depends on the velocity of the air (90% for 2.5 cu m/sec and 46% for 5 cu m/sec. Pre-filtration is recommended because fibrous cr large-size dusts or a short between the charging plates caused by high humidity will decrease the efficiency. The cost of the equipment and maintenance for one year is tabulated for air flow of 100 cu m/min and 30 cu m/min.##

07205

"SMOK-CLEAN" A NEW DEVICE TO ELIMINATE CITY SMOG.
"Smok-Clean" Nuovo Depuratcve per Eliminare lo Smog delle Citta. Fumi Polveri (Milan) 7 (4), 93-6 (Apr. 1967). It.

The smog purifier consists of four parts: a heat exchanger, a purifier, a basin for the washing solution, and a ventilator. The washing column is filled with inert material. Here, the combustion fumes come in contact with a water solution which precipitates the carbon particles and physico-chemical absorption of the sulfur oxides occurs. The use of a cheap material that could resist the corrosive action of sulfurous and sulfuric acids is necessary. It was found that Moplen (a polypropylene product of Montesud Petrochemical) was suitable. Between the heater

and the Noplen washer, a metal heat exchanger is placed to cool the 220 deg. C-230 deg C fumes from the heater down to 120 deg C-130 deg C. The advantages of using the "smok-clean" device are that it is cheap to operate, it does not produce fumes, and it is safe and relatively noiseless. It is also efficient, for it eliminates 98% of the sulfur oxides and 96% of the carbon particles.##

07549

N. Yamate

AIR POLLUTION BY TOXIC GAS AND ITS COUNTER MEASURE. Text in Japanese. Kuki Seijo (Clean Air, J. Japan Air Cleaning Assoc., Tokyo) 3(2):19-25, 1965. 5 refs.

The present status of air pollution in Japan and its counter measures are described according to the chemical composition of the pollutlants: sulfur oxides, nitrogen oxides, halogen compounds, organic compounds, and solid particles (dusts). The hourly variation of SO2 concentration is graphed. In Tokyo, there is a peak around noon of about 15 pphm; NO2 ranges from 1 to 1.5 pphm with little variation. Concentrations of SO2, NO, NO2, H2S, and CO were measured in Yokkaichi, Osaka and Ube as well as in Tokyo. Graphs relating amount of traffic to CO concentration show almost the same pattern. Concentrations of HCl and HF in the air are quite small (0.35 ppm and 0.3-0.4 micrograms/cu m., respectively) near chemical plants producing these gases. Counter measures used against the various pollutant emissions are: the dry method, wet method, activated carbon method for sulfur oxides; alkali or oxidation method for nitrogen oxide; dry iron oxide and dry absorption methods for H2S; and water washing method for HCl and HF. Afterburner methods by sparking and heat concentration are described for control of automobile exhausts. However, problems encountered with the afterburner methods are the high temperature required and nitrogen oxide increase. The equipment required is also rather large. Another method employing catalysts is described in which lead, molybdenum, white gold, nickel or vanadium are used effectively.##

07552

Billings, Charles E., Charles Kurker, Jr., and Leslie Silverman

SIMULTANEOUS REMOVAL OF ACID GASES, MISTS, AND FUMES WITH MINERAL WOOL FILTERS. J. Air Pollution Control Assoc., 8(3):195-202, Nov. 1958. 20 refs. (Presented at the 51st Annual Meeting, Air Pollution Control Assoc., Philadelphia, Pa., May 26-29, 1958.)

Investigations have indicated that two in. thick filters at four lb/cu. ft. packing density will remove up to 80% of acid mist and up to 99% of acid gases and fumes. Total filter life depends upon concentration of contaminant in the entering air. A

summary of filter performance is given. Estimated operating life based upon one use of the filter material can be obtained from the data given. With particulates such as iron oxide and fly ash, it has been found possible to wash and reuse filters about ten times. When iron oxide was collected simultaneously with SO2, filters were reused about eight times. Acid gas collection is significantly improved by the presence of moisture on slag wool filters. Mineral wool filters have several features such as, low cost (about 1 cents/lg.), small fiber diameter (4 micron and ability to withstand high temperatures (1000 deg F.). Slag wool will simultaneously remove sub-micron particulate materials with 90 to 99% efficiency. Resistance to flow through two in. slag wool filters (with an HF efficiency of 95%) is on the order of one or two in. of water, or if continuously moistened, at most 6 in. of water.##

07554

Donahue, J. L.

SYSTEM DESIGNS FOR THE CATALYTIC DECOMPOSITION OF NITROGEN OXIDES. J. Air Pollution Control Assoc., 8(3):209-212, 222, Nov. 1958. 6 refs. (Presented at the 51st Annual Meeting, Air Pollution Control Assoc., Philadelphia, Pa., May 25-29, 1958.)

The control of exhausts from industrial and chemical operations containing harmful concentrations of nitrogen oxides is accomplished by catalytic reduction of the gases. Catalytic destruction of nitrogen oxides, system designs currently in use on industrial applications, and operating performance are discussed. By mixing a hydrocarbon, or reactive fuel with the gases, and passing them through a catalyst, the end products are odorless, color-free, and harmless gases. Catalytic reduction of nitrogen oxides can be accomplished at either atmospheric or elevated pressure. The main components are the preheater, exhaust fan, and catalyst bed. As the process waste gases enter the system, they become mixed with and preheated by the recycled portion of the stream. The combined stream then passes the preheater. Following this, the reducing fuel is sparged into the system, and the combined stream enters the exhaust fan, is thoroughly mixed, and discharged through the catalyst element. Here, the oxidation of the sparge fuel and reduction of the nitrogen oxides takes place, with heat release in proportion to the sparge fuel supplied. For elevated pressures designers now incorporate a Catalytic Pressure Reactor, installed between the process tail gas outlet and the expansion turbine. A dual result is thus obtained; the catalyst reduces the oxides of nitrogen to produce a clear, clean, effluent, and the power recovered through the turbine is increased many times by the greatly elevated temperature of the gases. To date, there have been no reports of personnel discomfort, or corrosion attributed to exhaust streams whose oxides of nitrogen content has been reduced by processing in a catalytic system. In every case, users report complete elimination of the characteristic color and odor, which are otherwise strongly in evidence.##

07593

Panel on Electrically Powered Vehicles

THE AUTOMOBILE AND AIR POLLUTION: A PROGRAM FOR PROGRESS. Los Angeles County Air Pollution Control District, Calif., 51p., Oct. 1967.
GPO: 0-278-482

Air pollution problems from the viewpoint of automotive transportation were studied in general and all possible alternatives to the current gasoline engine were investigated by the Panel on Electrically Powered Vehicles. The Panel made sixteen recommendations for the Federal Government with respect to its role concerning air pollution resulting from automotive emissions. Technology and the control of automotive air pollution and the role of industry are also discussed.##

07613

Ridgway, S. L. and J. C. Lair

AUTOMOTIVE AIR POLLUTION: A SYSTEMS APPROACH. J. Air Pollution Control Assoc., 10(4):336-340, Aug. 1960. 1 ref. (Presented at the 52nd Annual Meeting, Air Pollution Control Assoc., Los Angeles, Calif., June 21-26, 1959.)

The application of systems engineering to the control of pollution from automotive exhaust is illustrated. First, the design and complex mechanical function of the flame afterburner system are analyzed. The efficiency of the device is discussed. Secondly, an analysis is made of the natural meteorological modulation of the concentration of air pollution to form an estimate of the results that might be brought about by the control of emissions. By examination of past records, September was found to be the worst month of the smog season. Concentrations of ozone and carbon monoxide for the month of September from 1955-1958 were studied. It was deduced, on the basis of analysis, that a pollutant which contributes to smog formation must be reduced in concentration by a factor of 2 or 3 in order to reduce the worst September experience to the level of the best. The efficiency of control devices required to reduce today's pollution is calculated.##

07881

Gruner, J., M. E. Harris, V. R. Rowe, and E. B. Cook

EFFECT OF RECYCLING COMBUSTION PRODUCTS ON PRODUCTION OF OXIDES OF NITROGEN, CARBON MONOXIDE AND HYDROCARBONS BY GAS BURNER FLAMES. Preprint, Bureau of Mines, Pittsburgh, Pa., 42p., 1967. 24 refs. (Presented at the Symposium on Air Pollution Control Through Applied Combustion Science, 16th Annual Meeting, American Inst. of Chemical Engineers, New York City, Nov. 26-30, 1967)

Gas appliances designed to lessen the emission of oxides of nitrogen, carbon monoxide, and hydrocarbons, are desired.. The formation and decay of oxides of nitrogen and carbon monoxide in the secondary combustion zone of gas-burner flames were investigated as functions of temperature, cooling rate (temperature gradient), and degree of recycling of combustion products into the primary combustion zone of the flame; preliminary measurements were made on hydrocarbons from flames. Recycling, though effective in reducing nitrogen oxides concentrations in effluent from gas appliances, makes the flames longer and less stable. Nitrogen oxides may be reduced by keeping the primary combustion temperature as low as possible, preferably no higher than about 3,000 deg. F., and by starting to cool the combustion gases as soon as possible to about 2,300 deg. F at which temperature concentrations of nitrogen oxides do not increase within the residence time in most gas appliances. Concentrations of carbon monoxide are lowered by recycling of flue gases. The oxidation rate of carbon monoxide is strongly increased by increasing the oxygen concentration. Although the point has yet to be proven by future research, it appears that carbon monoxide concentrations may best be lowered by appliance designs that allow rapid induction of secondary air into the secondary combustion zones. Hydrocarbons can escape from gas burner flames by flowing from the preheat zone of partially lifted flames through the dead space into the surrounding cold atmosphere. Recycling of combustion gases, very low fuel-air ratio, and very high flow rates tend to promote partial lifting of flames from burner ports. It is possible that the emission of hydrocarbons by gas appliances may largely be avoided by designing for well-seated flames on burner ports.

07884L

M. Iew, R. Woodruff, W. Johnson, W. Musa

ION EXCHANGERS IN REMOVAL OF AIR CONTAMINANTS. San Francisco Bay-Naval Shipyard, Vallejo, Calif., Chemical Lab.-8024-66, PR-1, ((30))p., March 1967. ((50)) refs.
DDC: AD 808060L

The ability of ion exchangers to be synthesized, modified, regenerated, or used in customary form to react with gaseous air contaminants and effect removal of these contaminants from air was studied. Results show that treated and untreated ion exchangers will react with a variety of gaseous materials and thereby cause removal of these materials from air. Reactions which occur between ion exchange resins and ionized reactants in aqueous media will likely occur in gaseous systems. The possibilities of reactions between exchangers and organic contaminants at nominal temperatures cannot necessarily be foreseen. Favorable reactions between organic vapors and exchanged groups on ion exchange resins are being sought.**

07893

Stern, Arthur C.

AIR POLLUTION CONTROL - PROBLEMS FOR THE AUTOMOTIVE ENGINEER. Preprint, Public Health Service, Washington, D. C.,

National Center for Air Pollution Control, 15p., ((1967)). (Presented at the National West Coast Meeting, Society of Automotive Engineers, Portland, Oreg., Aug. 16, 1967.)

The contribution of the automobile and other gasoline power vehicles to pollution are discussed. The adverse effects and the contributing pollutants are cited. Control efforts are being undertaken under the mandate of the Motor Vehicle Air Pollution Control Act, which authorizes the establishment of standards for the emission of substances harmful to public health. Compliance certification of new motor vehicles and engines and the technical problems involved are discussed. Approaches to vehicular-emission control are discussed, specially the inter-relationship of engine, fuel, and refinery design. The corresponding problems of the automotive engineer are cited.

07921

Benforado, David M., Pauletta, Carl E., and Hazzard, Noel D.

ECONOMICS OF HEAT RECOVERY IN DIRECT-FLAME FUME INCINERATION. Air Eng., 9(3):29-32, March 1967. 3 refs.

Direct-flame fume incineration as an effective and economical air pollution control process is discussed. Its advantages over thermal incineration without a flame, its use in conjunction with heat recovery equipment are topics also covered. Direct-flame incineration, economy of heat recovery equipment, practical solution to air pollution problem, control equipment requirements, design criteria, information required by equipment manufacturer and measurement of effectiveness of equipment are also discussed.

07931

Ertl, D. W.

ELECTROSTATIC GAS CLEANING. S. African Mech. Engr. (Johannesburg), 16(8):159-168, March 1967.

Electrostatic precipitators are a highly developed and efficient means of cleaning industrial and waste gases, satisfying all modern hygienic and industrial requirements. Each precipitator has to fulfill two functions: (1) electrically charging the dust and capturing it by electrodes which are at earth potential; and (2) passing this precipitated dust, with minimum re-entrainment losses, into the hoppers underneath the precipitation field. Parameters influencing the total dust collecting efficiency are: the ratio of the collecting plate area to gas flow rate, which is a dimension of the precipitator size; the migration velocity or the velocity by which the dust is attracted to the collecting plate under electrical forces, which is dependent on field intensity; the dielectric constant of the dust; the dew-point of the gas/dust mixture, high dew-point being better suited for precipitation than a completely dry gas. Factors

adversely affecting precipitation efficiency are space charges, which develop when there are large amounts of very fine dust in the gas, and dust resistivity, which makes precipitation difficult when the dust layers have an electrical resistance of greater than approx. 10 to the 11th power ohm/cm. Precipitators are important for thermal power stations where the dust fineness must also be taken into account in design. The use of precipitators for blast furnaces and steel works, cement works, and in the chemical industry, is noted. Dust collecting efficiencies of 99.5% are not exceptional and greater efficiency is advisable in continuous operation at numerous plants. For optimum dust collecting results, the specific dust properties have to be taken into account during the planning stage of the whole plant.##

08036

Wicke, E.

FUNDAMENTALS OF CATALYTIC AFTERBURNING. (Grundlagen der katalytischen Nachverbrennung.) Chem. Ingr. Tech. (Weinheim), 37(9):892-904, Sept. 1965. 27 refs. Translated from German. Joint Publications Research Service, Washington, D.C., R-8885-D, 33p., Jan. 12, 1968.

Catalytic afterburning proved itself as suitable for the removal of objectionable and harmful impurities from industrial exhaust gases in a number of instances. The length of the catalyst stretch that must be passed by the exhaust gases to attain a certain degree of conversion (degree of oxidation) can be characterized in terms of the 'length of a conversion unit' provided that the reaction is first-order and proceeds approximately isothermally. This term encompasses in a rational manner the effects of reaction rate and catalyst activity (including catalyst porosity and internal surface), gas flowthrough, longitudinal mixing, and material transfer between gas flow and catalyst surface. The material transfer imposes minimum lengths for a conversion unit; these were explained in more detail for a particle layer and for insert catalysts with perpendicular flow within tube clusters. If the conditions deviate strongly from formal kinetics of first order, this treatment no longer remains applicable, as has been shown on the example of an autocatalytic oxidation of CO on a Pt carrier catalyst. At higher concentrations of components to be oxidized, increasing temperature profiles develop along the catalyst layer: these were discussed under the assumption that the operation is adiabatic. As the heat generation and the activation energy of the reaction increase, more and more of the total conversion will crowd into a relatively short layer cross section with a steep temperature gradient. Under certain conditions, thermal instabilities may occur here for the catalyst. These lead to the formation of "combustion zones," which are stationary only at a characteristic "combustion rate" and gas flow rate within the catalyst layer. Curved combustion zones are able to adapt themselves within wide ranges to changing gas flow rate by expansion or shrinkage. Concentration profiles measured in a combustion zone created with a butane/oxygen mixture indicate the intensity of the reaction in the steep temperature rise range.

Combustion zones could be created at relatively small temperature gradients (about 200 deg) and relatively low intake temperatures in the autocatalytic oxidation of CO on Pt catalysts. AS##

08055

Hardison, L. C.

CONTROLLING COMBUSTIBLE EMISSIONS. Paint Varnish Prod., 57(7):41-47, July 1967.

The control of solvent emissions may be handled by adsorption, thermal incineration, and catalytic incineration. Adsorption has the disadvantage of requiring reconstitution of the solvent and presents a complex addition to the manufacturing procedure. Adsorption as a means of concentrating solvent into a smaller stream for subsequent incineration appears attractive for some paint spray applications. Incineration provides the most nearly universal answer to the solvent emission problem, and perhaps the most costly. Catalytic incineration is not universally accepted at the present time because of the lack of evidence of sustained performance, and will require a guarantee of service and replacement in order to gain acceptance for solvent emission control. Thermal incineration, on the other hand, can be assumed to sustain a given performance level if the flows, temperatures, etc., are held constant. This will be the main tool for solvent incineration in the coating industries in the near future.

08075

Griswold, S. S.

REGULATION OF NEW MOTOR VEHICLES. Preprint, Public Health Service, Washington, D. C., Division of Air Pollution, 7p., 1966. (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 12-14, 1966.)

The problem of air pollution from motor vehicles is discussed. The basis for the discussion is the Motor Vehicle Air Pollution Control Act. It is an amendment to the Clean Air Act of 1963 and was signed by President Johnson on October 20, 1965. It is designed to achieve uniform national control by limiting the emission from all new motor vehicles introduced into commerce, whether manufactured in the United States or imported from abroad. It authorizes the Secretary of Health, Education, and Welfare to establish standards for the emission of any substance which in his judgment is, or may be, injurious to public health or welfare and to require compliance with these standards. At the same time the Act specifies that appropriate consideration be given to technological feasibility and economic costs in prescribing standards applicable to new motor vehicles or engines. Federal emission standards were formally promulgated on March 30, 1966. These standards are applicable to the 1968 model year and reflect those currently in effect in the State of California. To implement these standards, to test for compliance and, generally, to provide the necessary machinery for insuing that

the public gets the control it needs, the Abatement Branch of the Division of Air Pollution is establishing a fully equipped laboratory at the Willow Run Airport near Detroit. This laboratory also has the responsibility for evaluating the adequacy of existing standards and the need for more severe standards and less complex test procedures. Field surveys of equipped vehicles in California and elsewhere are also being being conducted. Initial certification of new systems is approved on the basis of performance of test vehicles, but the continued approval for succeeding years will be determined by the systems' effectiveness when evaluated under realistic driving conditions.##

C8162

Matsak, V. G.

THE PURIFICATION OF AIR POLLUTED BY VAPORS AND GASES. In: Survey of U. S. S. R. Literature from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, 177-185, May 1960.
CFSTI: TT 60-21475

Methods for the recovery and purification of noxious substances ejected by gas exhaust and ventilating installations are reviewed. It was found easier to purify exhaust gases than ventilating air. The methods include: Chemical purification method, Condensation method, Liquid absorption method, and Absorption by solid absorbents (adsorption). Present methods for air and gas purification can be rendered close to 100 percent free of most acid and alkali gases, organic solvent vapors and some other gases. But no effective and cheap method has been found up to the present for the recovery of carbon monoxide. Purification of air from solvent vapors, such as gasoline, acetone, acetates, etc. can be used effectively only in the case of tail gases and not in the purification of ventilating air, even though it is effective in both instances; the high cost makes its use for purification of ventilation air economically prohibitive. The possibility of using solid absorbents, such as activated charcoal and silicagel for the purification of ventilation air may apply to many cases. The primary obstacle lies in the high cost of adsorbent material and in the consumption of considerable electric energy in overcoming the pressure drop of recuperating installations.

08207

Scurirajan, S. and Mauro A. Accomazzo

THE APPLICATION OF THE COPPER OXIDE-ALUMINA CATALYST FOR AIR POLLUTION CONTROL. Can. J. Chem. Eng. (Ottawa), 39(2):83-93, April 1961. 8 refs.

The catalytic combustion of 1-hexene present in diluent nitrogen in the concentrations of 1170 ppm and 3000 ppm by excess oxygen, has been studied in the presence of CuO-Al2O3 (1:1) catalyst in the temperature range 242 deg. to 424 deg. C. and gas space velocity in the range 4000-16,000 hr.-1. The experimental data on the kinetics

of the reaction were found to fit an empirical half-order law with respect to the 1-hexene concentration. The presence of water vapor in the reactants was found to have no effect on the efficiency of the catalyst at temperatures higher than 400 deg. C. The above results were similar to those obtained for the catalytic oxidation of n-hexene studied earlier. The possible use of the above copper oxide-alumina catalyst for the simultaneous removal of hydrocarbons and carbon monoxide present in the auto exhaust gases has been tested, making use of a 1955 six-cylinder automobile engine run on leaded gasoline fuel. The hydrocarbon and carbon monoxide concentrations encountered in these studies varied in the range 170-16,000 ppm and 1-7 percent respectively. It was found that the minimum initial temperature of the catalyst bed required for the complete removal of both hydrocarbons and carbon monoxide, simultaneously, was 226 deg. C. under no load condition, 342 deg. C. under an engine load of 2.5 hp, 400 deg. C. under an engine load of 5.1 hp or higher, and 236 deg. C. under deceleration conditions. The catalyst showed no deterioration in performance even after 100 hours of continuous service in conjunction with the above auto exhaust gases. Authors abstract

08345

Cooper, Jonathan C. and Frank T. Cunniff

CONTROL OF SOLVENT EMISSIONS. Proc. MECAR Symp., New Developments in Air Pollution Control, Metropolitan Engineers Council on Air Resources, New York City, p. 30-41, Oct. 23, 1967.

Four different approaches can be taken toward controlling solvent vapor emissions from industrial and commercial operations. One way is to avoid air pollution entirely by using water as the solvent. A second approach is to reduce the severity of the pollution by changing to organic solvents with low photochemical reactivity. A third control method is to destroy the escaping solvent vapors by incineration. When properly designed and installed this method is very effective and the capital costs involved are moderate. The fourth type of control method is to capture the emitted solvent vapors so that the solvent can be recovered for reuse. Three techniques are available - adsorption of the vapors in a scrubbing liquid, condensation by cooling, and adsorption on activated carbon. Of these, activated carbon adsorption is the most generally applicable and is capable of achieving the highest degree of solvent recovery, with resulting attractive paycut.##

09238

Mader, P. P., and E. S. Mills

CONTAMINANT CONTROL IN SPACE CABINS: APPROACH AND RESULTS. Aerospace Med., 38(8):822-825, Aug. 1967, 4 refs.

The systematic screening of materials and supplies intended for use inside space cabins is described. Materials were screened on

the basis of their outgassing properties at 120 deg F. for 72 hrs. in an apparatus consisting of a closed 72-1. Pyrex flask containing 50 percent 02 and 50 percent nitrogen and equipped with several inlet tubes through which gas samples were withdrawn for gas chromatographic and infrared analysis. Pressure within the flasks was adjusted to 0.5 atm. The test temperature of 120 deg F. was selected as the highest level at which the chromatograms and infrared spectra were still representative of the actual components in the gaseous system. When paints and finishes were tested, a water-based methacrylate paint was found to release the smallest amounts of outgassing products, while epoxy paint and polyvinyl acetate released considerably larger volumes of outgassing products. A sound dampener was discarded when tests indicated the release of substantial amounts of formaldehyde. Glasswool and asbestos ribbons released large amounts of organic compounds, although they had been previously flashfired at 700 deg F. One insulating material was selected after 6 were screened. Trichlorethylene, used as a space cabin cleaner, should not be used for a final cleaning of a space cabin simulator because it forms toxicchlorinated acetylenes. Atmospheric contaminants were also measured during a 30-day test of the space cabin simulator by 4 men.##

09315

Newhall, H. K. and E. S. Starkman

DIRECT SPECTROSCOPIC DETERMINATION OF NITRIC OXIDE IN RECIPROCATING ENGINE CYLINDERS. Preprint, Society of Automotive Engineers, 18p., 1967. 35 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670122).

A theoretical and experimental investigation was carried out to determine the mechanism whereby nitric oxide is formed, conserved, and exhausted from the reciprocating engine combustion chamber. The equipment utilized a magnesium oxide window to transmit the infrared radiation from the combustion chamber; a monochrometer to disperse the radiation, and a cryogenically cooled semiconductor to sense and indicate the nitric oxide produced radiation. The results confirmed the theoretical prediction based on chemical kinetics that nitric oxide, once formed in approximately equilibrium quantities in the combustion process will thereafter not disappear because the engine expansion takes place more rapidly than the kinetic processes can accommodate. The theory and measurements allow more rational explanations for the well documented influences which mixture strength, spark timing, compression ratio, and engine speed exert on oxides of nitrogen concentration in engine exhaust. (Authors abstract)

09340

Newhall, Henry K.

CONTROL OF NITROGEN OXIDES BY EXHAUST RECIRCULATION - A PRELIMINARY THEORETICAL STUDY. Preprint, Society of Automotive Enigneers, 10p., 1967. 15 refs. (Presented at the

Mid-Year Meeting of the Society of Automotive Engineers, Chicago, Ill., May 15019, 1967, Paper 670495.)

The control of nitrogen oxides by exhaust recirculation has been evaluated theoretically by digital computer simulation of the engine cycle. Nitric oxide emission, power output, and fuel consumption have been considered. Preliminary results indicate that effectiveness of the recirculation method of nitric oxide control can be accounted for by the attendant shift in the peak temperature chemical equilibrium species distribution. The analysis reveals that nitric oxide reduction is highly dependent on fuel-air ratio, and somewhat less dependent on the temperature of recycled exhaust gases. (Author's abstract)##

09780

Environmental Science Services Corp., Stamford, Conn.

AIR POLLUTION CONTROL PRIMER. 35 p., ((1968)).

The main sources of air pollution are combustion processes, especially internal combustion engines. In a general manner the following are discussed: causes and effects of air pollution; legal aspects; automobile emissions; fossil fuels and lead additives; and control equipment and its market potential.

09781

Environmental Science Services Corp., Stamford, Conn.

SOLVENT EMISSION CONTROL LAWS AND THE COATINGS AND SOLVENTS INDUSTRY. (A TECHNO/ECONOMIC STUDY.) 56 p., ((1967)). 6 refs.

The widespread adoption of the strict California solvent emission laws will seriously effect practices and products in the surface coating industry. The California codes contain three main elements: the emission of photochemically reactive solvents is restricted; the sale of coatings containing these materials is banned; and the emission of these materials during the manufacture of coating materials is restricted. Widespread adoption of these codes would cause changes in the formulation of the coatings, and would adversely affect the markets for mineral spirits, napthas, substituted aromatics, branched ketones, olefins, and trichloroethylene. However, alcohols, esters, odorless mineral spirits, and glycolesters would gain markets at the expense of the photochemically active solvents. Emission control methods, analytical techniques, and measurement methods are outlined. The effectiveness of various organic solvents in photochemical smog formation is discussed. An evaluation of existing regulations, with emphasis on California Rule 66, is presented along with lists of exempt sources.

09981

Tikhonenko, A. D. and M. N. Nabiev

NATURAL-GAS CATALYTIC REDUCTION OF NITRIC OXIDE TAIL GASES FROM NITRIC ACID PRODUCTION. Translated from Russian. Uzbesk. Khim. Zh., 11(4):6-9, 1967. 2 refs.
CFSTI: PB 178106T

The catalytic reduction of nitrogen oxides is the most progressive means of purifying tail gas from nitric acid production. The process of catalytic reduction of nitric oxides by methane in the form of natural gas at atmospheric pressure with the use of platinized nickel-chromium foil and a two-layer catalyzer is described. In operation over 710 hrs, the nickel-chromium foil showed sufficient thermal stability under conditions assuring complete purification of the gas; catalyst activity significantly decreased and was reduced with H2 at 320 deg. C. The conditions for complete nitric oxide reduction were found and also those for achieving the sanitary norm of NO+NO2 content (0.02 percent). In a two-layer catalyst it was possible to decrease the temperature of the gas entering the catalyzer to 450 deg. and the resulting CH4:O2 ratio was 0.8.

10017

Bloomfield, Bernard D.

CONTROL OF GASEOUS POLLUTANTS. Heating, Piping, Air Conditioning, 40(1):195-206, Jan. 1968. 26 refs.

Control technology in relation to air pollution involves the application, singly or in combination, of tall stacks for dispersion process changes, and control equipment. Most gaseous contaminants can be controlled using the techniques of absorption, adsorption, direct flame combustion, and catalytic combustion. The theoretical principles of design and operation preclude under most circumstances the use of any of the shelf items for air pollution control purposes. Good design, construction, and proper operation are the requisites of a satisfactory system. The special characteristics of a number of systems are described. A table of selected air quality standards is given for such pollutants as SOx, NOx, CO, H2S, and ozone.

10336

Sebastiani, Enzo

ELIMINATION OF NITROGEN OXIDES. ((L'eliminazione degli ossidi di azoto.)) Text in Italian. Securitas (Rome), 51(5):31-44, May 1966. 23 refs.

Some processing for eliminating nitrogen oxides (NO and NO2) from industrial flue gases are described. There are absorption processes in alkaline solutions, possibly in the

presence of oxidizing agents absorption processes based on the use of solid materials with high superficial development; catalytic reducing processes to elementary nitrogen or ammonia using palladium, platinum, rhodium or other similarly based catalysts working under pressure at a high temperature. As such processes present difficulties from the technical and economic standpoints when put into practice, the author expresses the hope that the problem will continue to be studied for the purpose of finding other simpler and more effective processes.##

10539

May, Hans and Harry Schulz

A NEW DISTRIBUTING INJECTION SYSTEM AND ITS POTENTIAL FOR IMPROVING EXHAUST GAS EMISSION. Society of Automotive Engineers, Preprint, 10p., 1968. 24 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1968, Paper 680043.)

The control principles and the design of a fuel injection system are described. In this system, injection time and injection pressure are controlled independent of each other. The injection time is controlled by two rotating discs having slots, which are turnable to each other and which are turned by the influence of a centrifugal governor in connection with a three-dimensional cam. With the three-dimensional cam, a punctiform scanning of engine characteristics can be realized. Some results obtained with this injection system are shown for example, fuel quantity characteristic, CO and n-hexane characteristic of a 4-cyl 4-stroke engine, injection pressure distribution dependent on crank angle, and consumption loops for injection and carburetor operation. (Authors' abstract, modified)##

10591

Grigoryan, G. O. and R. M. Kirakosyan

PREPARATION OF AMMONIUM SULFATE FROM LOW CONCENTRATIONS OF SULFUROUS GASES BY OXIDATION OF SO3 IN THE LIQUID PHASE USING ATMOSPHERIC OXYGEN IN THE PRESENCE OF NITROGEN OXIDES, USED AS INITIATORS. (Poluchenie sul'fata ammoniya iz nizkokotsentrirovannykh sernistykh gazov okisleniem SO3 - iona v zhidkoi faze kislorodom vozdukha v prisutstvii okislov azota, kak initsiatora.) Text in Russian. Army. Khim. Zh. (Erevan), 20(2):164-169, 1967. 10 refs.

Test results are detailed for an experimental installation where SO3 is oxidized into SO4 using atmospheric oxygen in the presence of nitrogen oxides as initiators. The method is a continuous technological process (with recovery of absorbents and filtrates) for the utilization of weak sulfurous gases and yields ammonium sulfate and multicomponent fertilizers. The technological procedure is flow charted. The procedure starts with a mixture of air and 0.6 - 1.0% sulfurous anhydride, to be passed through a suspension of magnesium hydroxide. The

resulting suspension is then oxidized by atmospheric oxygen, containing 0.002% nitrogen oxides. An almost complete oxidation of magnesium sulfite into magnesium sulfate takes place in the reactor at 40 Degrees C. The yield, magnesium sulfate, reacts with ammonia at 60 Degrees C. and pH 7. Magnesium hydroxide is then returned into the production cycle and the filtrate, containing ammonium sulfate and Schoenite, reduced to 1/3 of its volume by evaporation, is cooled to 15 Degrees C. The Schoenite crystals are then removed (and returned to the production cycle) and the ammonium sulfate solution evaporated and crystallized. Results show that 36.9% of the total ammonium sulfate returns to the production cycle with the magnesium hydroxide, with 20.8% remaining in the cycle as a Schoenite component, while 45.2% is extracted as end product.##

10637

Il'nitskii, A. P., A. Ya Khesina, S. N. Cherkinskii, and L. M. Shabad

EFFECT OF OZONATION UPON AROMATIC HYDROCARBONS, INCLUDING CARCINOGENS. ((Vliyanie ozonirovaniya na aromaticheskie, v chastnosti kantserogennye, uglevodorody.)) (English translation of: Gigiena i Sanit.), 33(1-3):323-327, Jan.-March 1968. ((11)) refs.
CFSTI: TT 68-50449/1

The efficiency of ozone in the inactivation of carcinogenic hydrocarbons was studied. Experiments were performed with 1,2-benzanthracene (BA), 1,2,5,6-dibenzanthracene (DBA), 9,10-dimethyl-1,2-benzanthracene (DMBA), 3,4-benzpyrene (BP) and pyrene (P) in various concentrations. Ozone concentration was 0.4 g per liter mixture. Ozonation was performed for periods 1, 2 1/2, 5 and 10 min. Results of experiments demonstrated that: carcinogenic hydrocarbons are vigorously destroyed by ozone. Aromatic hydrocarbons vary in their resistance towards ozone, 3,4-benzpyrene appearing to be the most stable. The resistance of a carcinogenic substance (3,4-benzpyrene) to ozone was found to vary according to whether it was in solution or adsorbed on particles of coal, soil, etc., it was found to be less stable in solution. Ozonation is probably very efficient for the purification of central water supplies containing dissolved carcinogens.##

10660

Laffey, William T. and Robert N. Manning

SOLVENT SELECTION FOR THE REDUCTION OF AIR POLLUTION. Hercules Chem., No. 56:1-6, March 1968. 5 refs.

Regulations restricting the use of solvents which partake in photochemical smog reactions have caused the solvent and surface coating industries to develop alternate solvent formulations. A system is presented whereby a restricted solvent can be simulated using combinations of allowable materials. The procedure is

graphical and depends on the solvent parameters and solubility characteristics of the materials. When several formulations are found which possess the required solvent properties, the choice of the best one then depends on economic or other factors.##

11033

Gamble, B. L.

CONTROL OF ORGANIC SOLVENT EMISSIONS IN INDUSTRY. Preprint, Continental Can Co., Inc., Chicago, Ill., ((24)) p., 1968. 4 refs. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-48.)

Extensive and careful source testing is required in order to evaluate a solvent emission pollution problem and to select suitable emission control equipment. When new equipment is considered, the system needs which are based upon a study of the functions to be performed, are determined. Test equipment is important for appraisal of performance of emission control equipment. For on site testing, the hydrogen flame ionization detector offers a reasonable approach for direct reading instrumentation design. Control methods for limiting the emission of solvents can be classified as Process Modification, Incineration, and Solvent Recovery. Discussion of these methods are given. Pictures and diagrams of control equipment and systems used in the control of organic solvent emissions are presented.##

11087

Rispoli, Jose A.

FIGHT AGAINST AIR POLLUTION IN ARGENTINA EDUCATIONAL, LEGAL AND TECHNOLOGICAL ASPECTS. Preprint, Tecnica de Higiene (Argentina), 20p., June 1968. 31 refs.

Air pollution is an increasing problem in the Argentina cities of Buenos Aires, Rosario, La Plata and Mar del Plata. Air pollution control measures are not keeping pace with the growth of industries, which are often located in neighborhoods of populated areas. The Municiple Director of Hygiene supervisors the problems of automotive emissions and industrial and domestic emissions. About one million vehicles travel daily in Buenos Aires. Traffic throughfares are being modified in order to eliminate congested traffic areas. The Director of Hygiene studies daily the chemical control of the pollutants of hydrocarbons, carbon monoxide and sedimented particles. The "Argentina Association for Air Contamination of sanitary education on all levels for the population.##

11584

Plust, Heinz G.

THE FUEL CELL AS AN ENERGY SOURCE FOR VEHICLE DRIVES. ((Die Brennstoffzelle als Energiequelle fur Fahrzeugantriebe.)) Text in German. Automobiltechnische Zeitschrift, 69(6):175-183, June 1968. 22 refs.

In the review of the theoretical and practical aspects of fuel cells as a replacement for the internal combustion engine it is noted that their use would markedly decrease the urban air pollution resulting from automobile exhaust gases. These cells derive their electrical energy directly from the oxidation of fuels such as hydrogen, hydrazine, or methanol, and transfer this energy with a high degree of efficiency to an electric motor. There is no exhaust, and the construction of these cells has advanced to the point where the speed and range of electrically powered vehicles are comparable to those of gasoline-powered automobiles; however, electric vehicles remain much heavier and more expensive to operate. The thermodynamic basis, operating characteristics, and fuel consumption of fuel cells are discussed, and the relative efficiencies of electrically-driven and gasoline-powered vehicles are compared. Some recent successful models of electric vehicles are described, and the advantages of the fuel cell over conventional storage batteries are noted. Mention is made of new developments as the LiCl, the NaS and $Zn(OH)_4$ batteries. It is concluded that electric vehicles will play a definite role in the future-particularly for specialized uses in warfare, industry, and urban transport, but that it will be 15-20 years before they are in widespread practical use.##

12392

Dodd, A. E. and J. W. Wisdom

EFFECT OF MIXTURE QUALITY ON EXHAUST EMISSIONS FROM SINGLE-CYLINDER ENGINES. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 16p. 2 refs. (Nov. 25-26, Paper 17.)

Tests of the effects of fuel mixtures on the composition of exhaust gases were performed on 325 cu cm- and 479 cu cm-capacity engines. On the 325 engine, the most noticeable effect of an improvement in mixture quality was to extend the weak limit. Hydrocarbon levels at full throttle and half load were lowest with the fully vaporized mixture and carburetor respectively. Differences in emissions between the four main systems were not great, however. Ratios of total to N.D.I.R. HC varied with mixture strength and reached a maximum at or near to stoichiometric air/fuel ratio. Nitric oxide emissions at full throttle peaked at about 16/1 air/fuel ratio and the peak moved towards stoichiometric mixture strength as the load was reduced. Minimum mass emissions of HC occurred at an air/fuel ratio of about 16.5/1, near to the peak of NO emission. CO levels at a given air/fuel ratio were higher with the fully vaporized mixture at full throttle than with any other system. On both engines, an increase in engine speed produced a reduction in HC emissions; CO variations with speed differed between engines. The effect of an increase in mixture temperature in the range 35-95 C was generally negligible. Residence time effects varied with fuel supply system; the better the atomization of fuel, the shorter the residence time for minimum emissions. At half load with dry mixtures and port injection, retarded ignition timing produced a reduction in emissions. (Author conclusions modified)

12637

W. Teske

EMISSIONS AND ABATEMENT OF OXIDES OF NITROGEN IN NITRIC ACID MANUFACTURE. Chem. Eng., No. 221, CE263-266, Sept. 1968.

The emission problem in the manufacture of nitric acid results from incomplete conversion of nitrous oxide to nitric acid. Some of the processes for reducing the emissions which are discussed briefly include: Alkaline absorption with milk of lime or aqueous ammonia; oxidation with hydrogen peroxide or ozone; absorption in an aqueous solution of magnesium oxide; removal as nitrosylsulfuric acid by treatment with a sulfuric acid, nitric acid mixture; and catalytic reduction processes.**

13029

Sonoda, Noboru, Naotake Matsumura, Noritaka Miyoshi, and Shigeru Tsutsumi

DESULFURIZING EFFECT OF OZONE OF LIGHT PETROLEUM DISTILLATES. (Teifutsu sekiyu ruibun no ozon ni yoru datsuryu koka). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan Ind. Chem. Sect.), 72(5):1099-1101, May 1969. 12 refs.

The desulfurizing effect of ozone on light petroleum distillate and on various organic sulfur compounds was studied. The experimental procedure was to pass a stream of ozone (about 1.7 wt % of ozone) at a speed of 350 ml/min through approximately 100g of experimental light petroleum distillate (bp 95 - 240 C) at 0 C. The experimental results indicate that more than 80% of the total sulfur in the light petroleum distillate can be removed by ozonization. Ninety % of the ozonized petroleum can be recovered. This recovery percentage can be obtained by dividing the ozonized petroleum by the experimental petroleum and multiplying by 100. The reactivity of sulfur compounds for ozone in desulfurization was found to decrease in the order of sulfides and thiols, thiphene, benzothiophene, hydrogen sulfide, elemental sulfur, and disulfides. The result also indicated that the rate of ozonization was in the order of thiols, hydrogen sulfide thiophene, elemental sulfur, sulfides, benzothiophene, and disulfides. Although the rate of ozonization of hydrogen sulfide is high, it's desulfurizing effect is low, while the reverse is true of the rate of ozonization and desulfurizing effect of sulfides. Sulfur dioxide was produced in the process of ozonization of various sulfur compounds. The significant amount of the gas was observed especially out of hydrogen sulfide and elemental sulfur.

13068

Trobisch, K.

OXIDATION PROCESSES FOR PURIFYING EXHAUST GASES OF CHEMICAL INDUSTRIES. (Procedimenti ossidativi per purificare gli effluenti gassosi nell'industria chimica). Text in Italian. Piv. Combust., 23(1):16-21, Jan. 1969.

Many industrial exhaust gases contribute to air pollution. There are various systems to purify these gases before they are vented into the surrounding air. Among them is chemical oxidation at normal temperature, a process in which the gas is scrubbed with oxiding solutions such as hypochlorites, chlorites, and permanganate. This process is used primarily to purify malodorous gases. Chemical oxidation at high temperature is achieved by thermic combustion, by torches, by incinerators, or by catalytic oxidation. Thermic combustion is used when the gas has a calorific power permitting an open flame combustion. Torches may be used under conditions of flame steadiness, smokeless combustion, flame low brightness, etc. Incinerators are used for gases without enough power to burn at open flame. Catalytic oxidation is used for gases exhaled by combustible materials when their calorific power is insufficient for combustion unless another substance is added. This system is used mainly to purify gases emitted by petrochemical plants. The biological oxidation system is used to eliminate the odor emitted by organic substances. In this case, gases are strained through a humid, stratified filtering mass containing highly concentrated bacteria which consume organic substances as food.

13160

Kita, Nobuyuki and Yoshiya Fuse

EXPERIMENTS TO INHIBIT NITROGEN OXIDES DEVELOPED WITHIN THE EXHAUST SYSTEM OF DIESEL ENGINES. (Diesel haiki gasu chu no chisso sankabutsu no hassei yokusei ni tsuite no 2, 3 no jikken). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan), 48(504):241-249, April 1969. 10 refs.

Nitrogen oxides are the main components of harmful gases which develop within the exhaust system of diesel engines. Experiments were performed using a one-cylinder Fulperland F-2 diesel engine (compression ratio of 22, 3 horsepower, 1500 rpm). Nitrogen monoxide and dioxide were measured by Salzmann's method. Concentration of nitrogen oxides ranged from 180 to 550 ppm; the more the load on engine, including the number of rotati rotations, the more was the concentration of nitrogen oxides with the maximum concentration of 1200 rpm. The ratio of nitrogen dioxide to nitrogen oxides decreased with the increased load on the engine, and was not influenced by the number of rotations. The development of nitrogen oxides was effectively inhibited by sending the exhaust gas partially back to the pre-engine combustion chamber. Nitrogen oxides were slightly inhibited by increasing negative pressure within the engine chamber. However, engine power was decreased by this procedure. By delaying the fuel injection time, formation of nitrogen oxides was slightly inhibited without decreasing the engine power. To confirm these results, these experiments should be repeated using a larger diesel engine.

13202

Schmitt, Karl, Wilhelm Ester, Hans Heumann, and Harry Pauling

NITROGEN OXIDE CONVERSION. (Hibernia Chemie GmbH, Gelsenkirchen-Buer, Germany, and Harry Pauling, Munich, Germany) U. S. Pat. 3,453,071. 7p., July 1, 1969. 4 refs. (Appl. May 16, 1966, 29 claims).

In the production of nitric acid and other nitrogenous products, exhaust gas is produced which contains significant quantities of nitrogen oxides, particularly NO and NO2. A process for absorbing these oxides and recovering them as ammonium nitrite includes adjusting the mole ratio of NO to NO2 to 1 and then introducing the adjusted gas into an ammoniacal solution of ammonium nitrate. The ammonium nitrate content of the absorbent solution is controlled so that the solution viscosity at any given temperature is higher than the viscosity of water at the same temperature. When the ammonium nitrate concentration is maintained at about 40 to 50 weight percent and the absorption process is operated at 20 to 30 C, at least half the ammonium nitrite formation takes place at the liquid-vapor interface. The remainder of the ammonium nitrite is produced in the gas phase by successive absorption of small amounts of gaseous ammonia in the vapor space, where it is neutralized with water vapor and nitrogen oxide to form ammonium nitrates as well as the ammonium nitrites. These dissolve in the absorbent solution. By preventing the development of easily decomposable ammonium nitrite mists, the process minimizes efficiency losses and explosion dangers.

13394

Austin, H. C. and W. L. Chadwick

CONTROL OF AIR POLLUTION FROM OIL-BURNING POWER PLANTS. Mech. Eng., 82(4):63-66, April 1960. 2 refs.

California law requires that stack-plume opacity not reach or exceed Ringelmann No. 2 shade for more than 3 min in any hr. To comply with this law, the Southern California Edison Company examined their industrial plumes. Gas emissions were measured for particulates, SO2, SO3, and NO. Plume opacity was found to be significantly affected by the amount and size of particulates, the amount of SO3 present, and the amount of water vapor present. Particulate removal was found to be most efficient with the use of an electrostatic precipitator which removes about 90% of the particulate matter. The most effective removal of SO3, SO2, and NO, 75-90%, could be accomplished by the use of a vanadium catalyst at high temperature, followed by introduction of ozone and electrostatic precipitation. This process proves to be economically unfeasible, however. It was found that NO formation is best limited by delaying the complete combustion in the boiler and protracting the flame path.

13535

Straschill, Max

THE REPROCESSING OF NITROGEN OXIDE-CONTAINING WASTE GASES IN PICKLING PLANTS. (Die Aufarbeitung nitrosehaltiger Abgase in Beizereien.) Text in German. Metall-Reinigung Vorbehandlung, 12(11):210-211, Nov. 1963. 3 refs.

The most practical method for detoxification of the nitrogen oxides that are present in pickling plant waste gases is through absorption and decomposition in aqueous solutions of alkalies, urea, aminosulfonic acid or ammonia. Of these, the ammonia process, in which a mixture of the waste gases and ammonia is passed through an activated charccal filter, possesses the advantage that the reaction which takes place at the filter yields stable ammonium salts. These do not attack the activated charcoal, and may be removed by scrubbing, thus restoring the efficiency of the filter. Other procedures, such as adsorption of the nitrogen oxides on activated charcoal, activated alumina, and activated silica are effective but rather expensive.

13537

Ermenc, E. D.

WISCONSIN PROCESS SYSTEM FOR RECCVERY OF DILUTE OXIDES OF NITROGEN. Chem. Eng. Progr., 52(11):488-492, November 1956. 10 refs.

The Wisconsin Process was proven technically feasible as a means of producing HNO3. The recovery system operated in accordance with design, except for minor modificaticns made in the field. Total cost of the nominal 40 tpd equivalent 100% HNO3 plant, including engineering and overhead, was slightly over $2,000,000, with about 60% of the cost in the recovery system. The bulk of the operating costs also cccurred in the recovery system. Since the system is not quite economical encugh for the production of a cheap chemical like HNO3 in the U. S., it may have eventual use in the production of N2O4 or recovery of dilute nitrogen oxides for pollution prevention. There may still be areas in the world where the Wisconsin Process may be econcmic, particularly where ammonia is expensive or not available.

13538

Childers, Eugene, Charles W. Ellis, and Donald J. Ryan

METHOD OF REMOVING NITROGEN OXIDES FROM GASES. (Du Pont De Nemours (E.I.) and Co., Wilmington, Del.), U. S. Pat. 3,125,408, March 17, 1964. 6 refs. (Appl. Dec. 19, 1955, 1 claim).

A process for the disposal of stack gases containing nitrogen oxide fumes is presented. The waste gas is first mixed with an

excess amount of a reducing gas containing 60-90% of an alkane. The mixture is passed over a platinum catalyst supported on activated alumina at a reaction temperature between 450 and 1000 C, and a space velocity between 25,000 and 150,000 reciprocal hr/cu ft of catalyst. The nitrogen oxide fumes are reacted with the reducing gas to form nitrogen, water, and carbon dioxide which can be discharged to the atmosphere.

13550

Bent, Franklin A.

PROCESS FOR THE REMOVAL OF NITRIC OXIDE FROM GASES. (Shell Development Co., San Francisco, Calif.) U.S. Pat. 1,888,547, 3p., Nov. 22, 1932. (Appl. May 14, 1931, 20 claims).

A process for removing nitrogen oxides, particularly nitric oxide, from waste gases comprises reduction of the gas with a chromous compound. The products of the reaction are probably hydroxlamine or ammonia, depending on the conditions of the reaction. Chromous salts of organic or inorganic acids may be used, and the reaction should take place at room temperature as high temperatures decrease the amount of nitric oxide taken up by the chromous salt solution. Neutral chromous compounds which are water soluble give the best results. Under certain conditions, it may be advantageous to use chromous compounds in the solid state with or without a support.

13554

Cohn, Johann G. E.

METHOD OF REMOVING NITROGEN OXIDES FROM GASES. (Engelhard Industries, Inc., Newark, N. J.) U. S. Pat. 3,118,727. 4p., Jan. 21, 1964. 9 refs. (Appl. Oct. 12, 1956, 11 claims).

A process is described for recovering heating values and purifying waste gases produced by the oxidation of ammonia in the production of nitric acid. Waste gases are mixed with a hydrocarbon fuel and the mixture is passed over a 0.1 to 5.0% by weight rhodium and/or palladium supported catalyst at the reaction temperature of 700-725 F. The heat generated in passing the mixture over the catalyst may be used to raise the gas temperature or to generate steam isothermally. Space velocity for the reaction may be in the range of 60,000-110,000 standard vols of gas/vol of catalyst/hr. The more hydrocarbon fuel used, the more complete is the removal of nitrogen oxides.

13662

Ganz, S. N., A. I. Luk'yanitsa and L. A. Bel'china

COMBINED PRODUCTION OF IRON-NITROGEN FERTILIZERS AND PURIFICATION OF GASES FROM NITROGEN OXIDES. (Kombinirovaniye

proizvodstva azotnozhelezistykh udobreniy s ochistkoy gaza ot okislov azota). Text in Russian. Zh. Prikl. Khim., 37(1):1609-1611, 1964. 2 refs.

Waste pickling solution from metal-working factories with an approximate content of 25% FeSO4 and 4-5% free H2SO4 can be used for purification of waste gases containing oxides of nitrogen. An unstable complex (Fe(NO)SO4) is formed when the gases are passed through the pickling solution, which on heating breaks down to give FeSO4 and pure NO, which can then be used to form HNO3. Treatment of the ferrous sulfate with ammonia and water gives a mixture of iron hydroxides and ammonium sulfate which can be used as fertilizer. In this paper, rates of absorption of NO and NO plus NO2 by solutions cf FeSO4 were studied at various conditions and concentrations of NO and NO plus NO2.

13689

Atroshchenko, V. I., A. M. Tseytlin, A. P. Zasorin, and V. S. Zolotarev

UTILIZATION OF NITROGEN OXIDES - BY-PRODUCTS OF CERTAIN INDUSTRIES. (Utilizatsiya okislov azota - otkhodov nekotorykh proizvodstv). Text in Russian. Khim. Prom. (Moscow), 1(1):79-80, 1960.

Production of nitric acid from exhaust gas with high NO content as compared with exhaust gas with low NO content plus NO2 is discussed. A method is described which involves cooling the gases to 25-30 C, introducing additional air, and carrying out oxidation in a cooler-oxidizer. About 8% absorption is achieved with 35% nitric acid absorbent. Specifications for an operating installation which produces 2500 kg of 55% acid are given. A modified version using oxygen rather than air is mentioned.

13707

Bylov, V. D., Yu. D. Znamenskiy, L. P. Kapitonova, and M. S. Shchedrov

ON THE SULFURIC ACID METHOD OF COLLECTING NITROGEN OXIDES FROM INCOMPLETELY OXIDIZED GASES. (K voprosy o sernokislotnom metode ulavlivaniya okislov azota iz nedookislennykh gazov). Text in Russian. Zh. Prikl. Khim., vol. 35:1503-1505, 1962. 3 refs.

Incompletely oxidized gases were oxidized with a solution of HNO3 in 93% sulfuric acid in a one-tray bubbling column to study aspects of sulfuric acid collection of nitrogen oxides. Maximum removal (79%) was achieved with a 5% HNO3 concentration and an input NO plus NO2 concentration of 0.573 volume percent. It is concluded that effective sulfuric acid removal of nitrogen oxides with 93% sulfuric acid can be accomplished after

preliminary oxidation with a 3-4% solution of HNO_3 in 93% H_2SO_4 when the oxidation and absorption cycles are carried out separately in the liquid phase.

13718

Trofimov, A. I.

REMOVAL OF NITROGEN OXIDES FROM COKE OVEN GAS. (Ochistka koksovogo gaza ot okislov azota). Text in Russian. Koks i Khim., no. 2:42-43, 1966.

An arrangement for removal of nitrogen oxides from coke gases, installed at the Yasinovskiy Coal-Tar Chemical Plant, is described. It converts NO to NO_2 (in 110-120 sec at 70-80 C and 15-16 bar), which in turn reacts with olefins to form a resin which, after cooling to 30-40 C, is washed in a scrubber filled with residue from 50 x 50 mm Raschig rings. The installation was designed for operating with a 0.8% oxygen content in the coke gas, but 0.4-0.5% oxygen is found sufficient, precluding the need for introducing air. Operational reduction of nitrogen oxides is from 12-18 to 2-3 cc/cu m. This arrangement was installed at a cost of 234,000 rubles.

13746

Daniels, Farrington, William G. Hendrickson, and Elton Gordon Foster

NITRIC OXIDE RECOVERY SYSTEM. (Wisconsin Alumni Research Foundation, Madison). U. S. Pat. 2,578,674. 14p., Dec. 18, 1951. 13 refs. (Appl. Mar. 28, 1949, 18 claims).

A process for the recovery of nitrogen oxides from gaseous mixtures is presented. The nitrogen oxide-containing gas is first cooled and then dried by passing it through a body, shower, stream, layer, or bed of solid adsorbent having a preferential adsorbability toward water, and the dried gas is then contacted with a catalyst mass having the function of accelerating oxidation of the nitric oxide content of the gas mixture to nitrogen dioxide. The dry gas mixture is contacted with particles of a solid adsorbent, such as silica gel, which separates nitrogen dioxide from the other components of the gas mixture. Adsorbed nitrogen dioxide is de-sorbed by circulating hot nitrogen dioxide through and in direct contact with the solid adsorbent material. The remaining adsorbed NO_2 is flushed out by means of hot dry air contacted with the solid adsorbent. When NO_2 is to be converted to HNO_3, oxygen-containing air is used, and when the NO_2 is to be liquified, hot dry CO_2 or nitrogen can be used.

13899

Varlamov, M. L., G. A. Manakin, Ya. I. Starosel'skiy, and L. S. Zbrozhek

INVESTIGATION OF THE AMMONIA METHOD OF REMOVING NITROGEN OXIDES FROM THE EXHAUST GASES OF A NITROGEN-OXIDE NITRIC-ACID TOWER SYSTEM. I. (Issledovaniye ammiachnogo metoda ochistki ot okislov azota otkhodyashchikh gazov bashennoy nitroznoy sernokislotnoy sistemy). Text in Russian. Nauchn. Zap. Odessk. Politekhn. Inst., vol. 40:24-33, 1962. 4 refs.

Data from laboratory study of the removal of low concentrations of nitrogen oxides using gaseous ammonia and ammonia water are presented. The use of gaseous ammonia, in conjunction with acoustic coagulation with an aerosol, yielded an average degree of removal of 85% when incoming gases were highly oxidized. Nitrogen dioxide, and an equimolecular mixture of NO and NO2, reacted with 82-93% completeness with gaseous ammonia, this value increasing slightly with increased reaction volume. A gas lift using ammonia water yielded 63.6% purification with a 40% content of nitrogen oxides. The degree of oxidation of industrial exhaust gases is an important factor determining the degree of purification by this method. The data given correspond to an equimolecular NO and NO2 mixture.

14007

Hsieh, Yu Hsioh

AN EXPERIMENT IN THE PRODUCTION OF NITROGEN FROM NITRIC ACID PLANT TAIL GAS. (Ts'ung hsiao suan wei ch'i chih ch'i t'an ch'i ti shih yen). Text in Chinese. K'o Hsueh T'ung Pao, vol. 10: 307-308, 1957. 6 refs.

By passing nitric acid tail gas first an alkali scrubbing tower to remove CO2 and then through a catalyst reactor to reduce NO2 and O2 in the presence of excess hydrogen, it was found practical to recover nitrogen. Three types of catalysts were made by depositing Cu and Ni on soil diatoms: CuO:diatoms, NiO:diatoms, and CuO plus NiO:diatoms, all in a 1:9 ratio. The highest absorption rate could be attained with a sodium hydroxide concentration of 1% and a gas linear velocity of 0.2 m/sec. The concentration of CO2 could be reduced to 30 ppm. By using CuO with a firebrick carrier at a temperature of 600-650 C, a space velocity of 6000 reciprocal hours, and 4-6% excess hydrogen, it was possible to produce a gas with 1-5 ppm NO, 10-20 ppm O2, and 400 ppm NH3. By using the copper-nickel catalyst with diatoms as carriers at a temperature of 300-500 C, a space velocity of 1500 reciprocal hours, and 5% excess hydrogen, a gas with 0.4-0.7 ppm NO, 10-20 ppm O2, and 300-500 ppm NH3 could be produced with the content of noxious gas within acceptable limits. The temperature of reaction increases rapidly with oxygen content of the tail gas and with space velocity. Since the reactor was of simple construction, there was no way to control the temperature, and no tests were performed under conditions of low temperature and high space velocity.

14C25

Byason, P. R. and J. Harkins

STUDIES ON A NEW METHOD OF SIMULTANEOUSLY REMOVING SULFUR DIOXIDE AND OXIDES OF NITROGEN FROM COMBUSTION GASES. J. Air Pollution Control Assoc., 17(12):796-799, Dec. 1967. 13 refs.

In this study, a high-sulfur fuel was used and SO2 concentrations were measured ahead of and following the catalyst bed to test the simultaneous reduction of SO2 and NO. Synthetic gas mixtures of SO2 in N2 and CO plus CO2 in N2 were combined in various proportions as the reactant gases. A number of different metals, supported on an alumina extrudate or on a silica gel, were tested for the reduction of SO2. The test gas contained twice the stoichiometric amount of CO. Tests for SO3 in the offgases were negative, as expected in a reducing atmosphere. The COS concentration depended on the composition of the reaction gas mixture. Generally the mixtures stoichiometric in CO showed somewhat less reduction than did the mixtures containing a twofold excess of CO. Reactant gas mixtures containing excess CO deposited sulfur in the cooler parts of the apparatus downstream from the catalyst bed, but this amount was negligible. To utilize the reduction reactions in a practical system at relatively high dilutions requires a catalyst, the most active being copper supported on alumina. Substantial reduction (90% or greater) can be achieved in 0.35 sec, corresponding to a space rate of 10,000 vol/vol/hr. A side reaction of carbon monoxide with elemental sulfur to form COS requires that the initial amount of CO be stoichiometric for the amount of SO2 plus the NO present. To employ this method for the purification of flue gases would require near stoichiometric fuel air operation of the furnace. Thermodynamic considerations show that the optimum initial ratio of CO to SO2 is somewhat less than 2 to minimize the production of carbonyl sulfide. Substantial reduction of undesirable sulfur compounds and essentially quantitative reduction of oxides of nitrogen are possible with this method.

14031

Harris, Samuel W., Edwin F. Morello, and Gavin H. Peters

PROCESS FOR DECOMPOSITION OF OXIDES OF NITROGEN. (Standard Oil Co. Inc., Chicago) U. S. Pat. 3,459,494. 2p., Aug. 5, 1969. 4 refs. (Dec. 14, 1966, 10 claims).

A process is claimed that can provide as high as 98 to 100% decomposition of nitrogen oxides into nitrogen and oxygen. The method consists of contacting nitrogen oxides with a high-melting solid catalyst selected from at least one member of the group comprised of alkali metal oxides, alkali metal silicates, alkaline earth metal oxides, alkaline earth metal silicates, and mixtures of these, at a temperature above 700 C for a time sufficient to accomplish the conversion. The contact of the nitrogen oxides with the catalyst should take place between

about 700 C and 1100 C, and preferably between 800 C and 1000 C. The degree of decomposition will depend upon the particular catalyst and temperature used. Operating details and possible variations of the process are described. The effectiveness of the method contradicts previous assumptions of the great difficulty of carrying out such decomposition, and by eliminating the use of platinum and paladium as catalysts, reduces the cost and adds to the commercial significance of this conversion technique. The high degree of conversion would make possible the use of the resulting air mixture for human consumption; by producing a breathable, oxygen-enriched atmosphere, the process may have applications in space travel, reduction of air pollution from industrial gas streams, purification of automobile exhaust gases, and reduced smog formation. For example a modification of the process is described which produces automobile exhaust emissions substantially free of all harmful nitrogen oxides; it is also contemplated that by use of this method, solid ammonium nitrate grains may be used as the source of nitrogen oxides in space exploration.

14034

Benson, Jack D.

REDUCTION OF NITROGEN OXIDES IN AUTOMOBILE EXHAUST. Preprint, Society of Automotive Engineers, Inc., New York, N. Y., 17p., 1969. 11 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690019.)

One of the reactants involved in photochemical smog is NOx, defined as the sum of nitric oxide (NO) and nitrogen dioxide (NO2) concentrations; NO, emitted by automobiles in exhaust gas, slowly oxidizes to NO2 under atmospheric conditions. Although the control of nitrogen oxides from automobile exhaust is not yet required by law, several methods were investigated to determine how much control is possible and what penalties result. These methods involved spark timing, carburetion, and exhaust recirculation. On one test car, a control system was developed which reduced nitrogen oxides 74% while maintaining hydrocarbon and carbon monoxide control at current (1968) federal levels. However, a 13% loss in fuel economy was incurred, and driveability problems were observed. Application to other car models, deposit accumulation, durability, and performance under extreme weather conditions are all open questions at this time. (Author abstract modified)

14073

Iozhkin, A. F. and N. L. Subocheva

RECOVERY OF NITROGEN OXIDES FROM LOW-CONCENTRATION GASES WITH ACTIVATED CARBON IN A MOVING LAYER. (Ulavlivaniye okislov azota iz nizkokontsentrirovannykh gazov aktivirovannym uglem v podvizhnom sloye). Text in Russian. Sb. Nauchn. Tr. Permsk. Politekhn. Inst., no. 18:61-74, 1965. 14 refs.

The absorbing capacity of grades KAD and AG activated carbon were found to be comparable when used in a stationary or moving layer to absorb nitrogen oxides in low concentration (about 1%). It was found that the higher the state of oxidation of the nitrogen oxides present, the greater the absorbing capacity of the activated carbon. The possibility of determining the linear rate of carbon motion from data on the displacement of a point of constant concentration in a stationary layer is verified. During thermal regeneration, the absorbed nitrogen dioxide dissociates into nitric oxide and oxygen, and there is an accompanying combustion loss of carbon with the formation of CO2. This carbon loss amounts to about 0.5% of the starting weight for KAL, and 0.4% for AD carbon.

14159

Thomas, Fred W.

TVA'S AIR QUALITY MANAGEMENT PROGRAM. Proc. Am. Soc. Civil Engrs., J. Power Div., Paper 6483:131-143, March 1969. 18 refs.

The air quality program of the Tennessee Valley Authority as related to its fertilizer and coal- and nuclear-fired power plants is reviewed. Preventive aspects of pollution control are basic to the program designed for steam-electric generating plants. Plants are located at sites where terrain is favorable to effective dispersion, and air quality measurements are recognized in planning and designing plant structures. The program is supplemented by an extensive monitoring system for measuring sulfur dioxide, fly ash, ozone, and nitrogen oxide emissions. Mobile sampling equipment is used in conjunction with stationary monitoring systems because it appreciably shortens the period required to define air quality in the vicinity of a plant. TVA also conducts extensive research studies on plume dispersion, levels of ground level fumigation during inversion breakup, and chemical processes for the removal of SO2 from flue gas. At nuclear plants, an extensive network of instruments monitors airborne particulates, radioiodine, heavy particulate fallout, and rainwater. TVA has sought to prevent deleterious effects from SO2 emissions primarily through the use of high stacks designed to limit SO2 concentrations at ground level. As unit size and plant capacity increase, stack heights are being raised from 170 to 800 to 1000 ft. With increasing worldwide attention focused on techniques for converting SO2 to sulfuric acid or fertilizer, TVA is now exploring the use of limestone in pulverized coal-fired units and cyclone-furnace units. Where fly ash creates a nuisance problem, TVA is substituting 95% efficiency precipitators for mechanical collectors.

14196

Peters, M. S.

CAUSES, IMPORTANCE AND CONTROL OF NITROGEN/OXYGEN COMPOUNDS IN THE FIELD OF AIR POLLUTION. (Ursachen, Bedeutung und Kontrolle

der Stickstoff/Sauerstoff-Verbindungen in der Luftverunreinigung). Text in German. Chem. Ing. Tech., 41(10):593-644, May 1969. 13 refs.

In heavy smog, nitrogen oxide concentrations of 1 to 3 ppm have been measured over some cities. Physiological effects on humans have been observed at 3 ppm and 8 hours of exposure. The nitrogen oxides in the atmosphere come mostly from motor vehicles and power plants, as well as from chemical plants, such as nitric acid production plants, plants for the recovery of catalysts, pickling plants, etc. In the gasoline powered engine, a high nitric oxide concentration is formed at ignition temperature (2200 C). Since the gases cool rapidly to ambient temperatures, no equilibrium conditions can be attained and the nitric oxide concentration of exhaust gas is rather high. There are two possible methods of avoiding this. The ignition temperature should be lowered or the gas should be cooled at a slower rate. Otherwise, a catalyst should be found which speeds decomposition of nitrogen oxides at low temperatures. There are also several methods for reduction of nitrogen oxides from stack gases. Adsorption on zeolites and certain other types of molecular sieves is a rather promising method. Intense research on these methods is recommended, since little is known about them.

14212

Reidel, John C.

AIR-POLLUTION CONTROL IN HOUSTON AREA. Oil Gas J., 54(18):107-109, Sept. 5, 1955. 3 refs.

A 30-ton-per-day sulfur recovery plant to prevent release of hydrogen sulfide to the atmosphere is described. The design features are operator control of amine feed to the amine stripper located at the sulfur recovery unit, release of hydrocarbon vapors from the stripper to the refinery flare, reactors and scrubber sections combined in one column, and instrumentation features allowing the plant to be operated by one man. The basic principle of the sulfur recovery process is summarized as follows: 3H2S plus 3O2 yields 2SO2 plus 2H2O; 2H2S plus SO2 yields xS2 plus yS6 plus zS8 plus 2H2O. In the final step, sulfur vapor is condensed and collected as liquid sulfur. Hydrogen sulfide recovery and the function of the amine stripper are discussed. Diagrams of the H2S and sulfur recovery processes are presented.

14255

Paleari, C. and F. Renzanigo

COMBUSTION PRODUCTS OF DIESEL FUEL. I. THE EFFECT OF AN IGNITION IMPROVING ADDITIVE ON THE NITROGEN OXIDE AND CARBON MONOXIDE CONTENT. (Prodotti di combustione di combustibili diesel. I. Effetti di un additivo promotore di accensione sui contenuti in ossido di azoto ed ossido di carbonio). Text in Italian. Riv. Combust., vol. 13:419-431, June 1959. 3 refs.

Investigations were made on the effect of gasoil compositions, the presence of ignition improvers, and of engine operation conditions on the nitrogen oxide and carbon monoxide content of a C.F.R. F-5 engine exhaust gas. With all the gasoils used during these tests, the highest nitrogen oxide contents were observed when the engine was running on intermediate loads. The effect of additives was seen only when the engine ran at minimum speeds. It was found that nitrate base additives reduce the exhaust gas CO content, particularly with low cetane number gasoils in engines on high loads. (Author summary modified)

14325

Lee, G. and A. C. Coulson

EUROPA 1. THE DESIGN AND DEVELOPMENT OF GAS SCRUBBERS FOR THE EUROPA 1 UPPER STAGES PROPELLANT SYSTEMS. Weapons Research Establishment, Salisbury, S. Australia, Dept. of Supply, TN DWD 22, 65p., Aug. 1968. 24 refs.
CFSTI: N69-27758

The design and development of gas scrubbers for the removal of N2O4, unsymmetrical dimethylhydrazine, and Aerozine 50 from nitrogen carrier streams are described. The final scrubber incorporates eight stages fitted with sieve plates made cut of an aluminum alloy. At the base of the unit, a stainless steel float valve controls the water outlet flow and maintains a gas-tight seal. The water flow-rate can be set at 0.5 gal/min. In the launcher installation, the umbilical mast vent lines to the fuel and oxidant scrubbers serving the second stage are fitted with nozzle plates at the scrubber inlet flange. These control the gas flow rate. The vent lines from all the other places are fitted with a flowrator and control valve, the arrangement being that manual control can limit the gas flow rate and maintain it while the pressure falls. To allow for imperfect scrubbing of N2O4 in the gas streams, the vent gases are led to 45 ft-high stacks situated 750 ft from the installations, and the effluent water is piped to soakage pits located at safe distances from inhabited areas. From the results, it was clear that high efficiencies are obtainable when stripping the fuel gases from an inert stream, but it is not possible at any gas flow rate to remove N2O4 down to 5 ppm using this technique. In trying to produce a scrubber system capable of coping with the high impulsive flows, it is probable that the best compromise for a gas scrubber was achieved. The scrubber is best suited to constant flow conditions or to flow conditions which have a limited range of variation.

14404

Hale, Edith A.

AUTOMOBILE POLLUTION ERADICATOR. (Assignee not given.) U. S. Pat. 3,456,439. 3p., July 22, 1969. 5 refs. (Appl. June 26, 1967, 3 claims).

The invention provides an improved means of eliminating the combustion residue (smog) from automobile exhaust. The fog is eliminated principally in a refrigeration unit connected to the muffler and the unburnt particles in the smoke are removed in a baffle unit which receives the output of the refrigeration device. Noxious gases which are mostly lighter than air, are then permitted to escape into the atmosphere. The system provides a clock device for automatic operation and a special power source for operating the system when the vehicle is not being used.

14424

Massa, Victor F. and George P. Gross

METHOD AND APPARATUS FOR TREATING AUTOMOTIVE EXHAUST GAS. (Esso Research and Engineering Co., Inc., Linden, N. J.) U. S. Pat. 3,460,901. 3p., Aug. 12, 1969. 6 refs. (Appl. June 11, 1965, 2 claims).

The invention provides a method for abating air pollution from automobile exhaust gas. It is concerned primarily with lowering the emission of unburned hydrocarbons and carbon monoxide by addition of an oxidation-initiating compound of aqueous hydrogen peroxide which promotes the conversion of the pollutants to innocuous CO2 and H2O. The liquid oxidant can be aspirated into exhaust gas for afterburning or injected in other ways suitable for dispersing it in carrier gas or directly in exhaust gas ports. An example of a device used for aspirating comprises a venturi scrubber and jet stream. This device can be adjusted to vary the amount of the oxidant in response to engine demand. The carrier gas in which the hydrogen peroxide-water mixture is dispersed can be air or recycled exhaust gas. By a simple valve mechanism, flow of the oxidant can be controlled and limited to periods of engine operation when unburned hydrocarbon emission tends to be highest, e.g., acceleration, deceleration, or idling. The system described can be used with both spark ignition and compression ignition engines. Further applications of the method include the treatment of exhaust gases containing lead residues or halogen compounds present in antiknock additives.

14448

Agneray, Louis, Maurice Bruni, Gerard Vandenbussche, and Arlette Clayer

RECOVERY OF NITROGEN OXIDES FROM INDUSTRIAL WASTE GAS BY COUNTER-CURRENT ADSORPTION. (Die Wiedergewinnung von Stickoxiden aus Industriegasen durch Gegenstromadsorption.) Text in German. Dechema Monograph, 59(1045-1069):139-146, 1968. 2 refs.

Nitric acid factories emit waste gases which contain considerable amounts of nitrogen oxides. Adsorption by silica gel seemed to be an economical method of recovery, so this method was tested. The adsorbent descended a vertical column countercurrent to the gas which was to be cleaned. First the water and then the NO2 were

adsorbed. Due to the catalytic action of the silica gel, NO is converted into N2O3 or NO2, which is likewise adsorbed. The adsorbent is recycled by pneumatic transport, but prior to that, it is desorbed by the simultaneous effect of heat and dry gas, the latter being a portion of the cleaned gas. The desorbed mixture is similar to the gas entering the column, except that it contains denser nitric oxide gases, water vapor, and nitric acid. It can thus be recycled to the nitric acid production line or it may be condensed to a weak nitric acid. The column gas a diameter of 10 cm and a height of 3 m divided into 3 zones for adsorption, concentration, and desorption. Silica gel with grain sizes from 0.71 to 0.84 mm was used. The temperature of the incoming water-saturated gas was about 40 C and its pressure somewhat more than 1 atm. The gas contained 0.4% by volume NO2 and 0.2% by volume NO; flow rate of the adsorbent was about 0.25 m/sec. Measurements of the cleaned gas indicated that it contained less than 50 ppm of nitrogen oxides. The gas developing upon desorption contained more than 5% nitrogen oxides. Based on experimental data, a column with a diameter of 2.50 m and a height of 17 m would be needed to clean 20,000 cu m/h of a gas of composition similar to that for the experiments. Such an adsorption column would consume 15 kwhr. The main advantage of this method is the low operating cost.

14481

Van Der Drift, J.

CATALYTIC REMOVAL OF NITROGEN OXIDES FROM WASTE GASES OF NITRIC ACID PLANTS. A METHOD FOR THE PREVENTION OF AIR POLLUTION. (Katalytische verwijdering van N-oxyden uit afgewerkte gassen van salpeterzuurfabrieken. Een methode voor de bestrijding van luchverontreiniging). Text in Dutch. Chem. Tech. (Amsterdam), 24(10):301-305, 1969. 11 refs.

Removal of nitrogen oxides from nitric acid plants can be achieved by catalytic decomposition or reduction. The catalytic decomposition follows the reaction 2NO yields N2 plus O2. With a copper-silica gel catalyst, the nitrogen oxide content of waste gas was reduced from 892 to 277 ppm at 510 C. The reduction method uses hydrogen, natural gas, or ammonia as reducing agents. Various installations for the removal of nitrogen oxides from waste gases are described. A heat exchanger is used to lower the temperature of waste gases from around 515 C to 300 C after reduction. Several commercial catalysts are described. In an experiment using Honeycombgrid HCM-S-900 and ammonia, waste gas of 100,000 vol/vol catalyst/hr containing 0.3% nitrogen oxides and 3% O2 (inlet temp. 286 C) was reduced to 50 ppm NO2 and 86 ppm NO plus NO2. Using 0.3% Pt on a Torvex ceramic honeycomb and natural gas, waste gas of 100,000 vol/vol catalyst/hr containing 0.3% nitrogen oxides and 2.58% O2 (inlet temp. 440 C) was reduced to 58 ppm nitrogen oxides.

14531

Eyzat, P. and J. C. Guibet

SIMULATION OF THE FORMATION OF NITRIC OXIDE DURING COMBUSTION IN AN ENGINE. (Simulation de la formation d'oxyde nitrique au cours de la combustion dans un moteur). Text in French. Rev. Inst. Franc. Petrole Ann. Combust. Liquides (Paris), 22(10):1530-1548, 1967. 3 refs.

Simulation of nitric oxide emission in engine exhaust gases by calculation from the pressure-time diagram was used in a computer program to determine the best combustion process with respect to nitric oxide formation and engine efficiency. The calculation of the pressure time diagram was first reviewed. Optimum operation was shown to correspond to rapid and relatively late combustion. The theoretical calculations of optimum combustion could be at least partially reproduced in actual running conditions.

14554

Stezhenskiy, A. I. and V. S. Luk'yanchikov

NITRIC OXIDE FORMATION IN GAS TURBINES. (Ob obrazovanii okisi azota v kamerakh sgoraniya gtu). Text in Russian. Fiz. Goreniya, Akad. Nauk Ukr. SSR, Respub. Mezhvedom. Sb., 1966:91-93. 5 refs.

It is estimated that existing gas turbines discharge 3 kg of NO2 per ton of natural gas consumed, or 720 tons of NO2 per 1000 kW of useful power per year. The NO concentration in gas turbine exhaust reaches 0.2 vol %. Calculations indicate that cooling of the exhaust gases with secondary air at a rate of 1000 deg/sec will assure almost complete dissociation of NO to N2 and O2.

14630

Schmidt, Alfred and Ferdinand Weinrotter

PROCESS AND EQUIPMENT FOR THE REMOVAL OF NITROUS GASES FROM WASTE GASES. (Verfahren und Vorrichtung zur Entfernung von nitrosen Gasen aus Abgasen). Text in German. (Lentia G.m.b.H., Munich) W. German Pat. 1,075,571. 4p., Feb. 18, 1960. 1 ref. (Appl. May 2, 1958, 7 claims).

A process is described for the removal of nitrous gases from waste gases, primarily from nitric acid factories. These gases are treated with a solution of magnesium nitrite, nitrate, and magnesium hydroxide and carbonate. Magnesium hydroxide and carbonate bind nitrous gases by forming magnesium nitrite. The latter is decomposed by heating to temperatures between 140

and 200 C at 3 to 6 atm according to the equation 3Mg(NO2)2 plus 2H2O yields Mg(NO3)2 plus 2Mg(OH)2 plus 4NO. A scrubbing solution concentration of 200 to 300 g magnesium nitrite/l must be maintained. The solid substance in the solution may not exceed 20%. The NO liberated in the process can be re-used, and the magnesium hydroxide which separates in crystal form can be recirculated. Alkali or alkali earth nitrates are added to the magnesium nitrite solution prior to re-use of the scrubbing solution. The equipment for the process consists of a conventional scrubber, a container heated by pressurized steam for decomposition of the magnesium nitrate lye, a reaction chamber, a chamber for oxidation of NO, and inlet, outlet, and return pipes.

14631

METHOD FOR THE COMPLETE REMOVAL OF NITROGEN OXIDES. (Werkwijze voor het volledig verwijderen van stikstofoxyden). Text in Dutch. (Hibernia-Chemie G.m.b.H., Gelsenkirchen-Buer, West Germany and Harry Pauling, Munich) Dutch Pat. 6,606,577. 13p., Nov. 21, 1966. (Appl. May 13, 1966, 23 claims).

The invention describes a method for the complete removal of nitrogen oxides from waste gases using ammonia with recovery of nitrogen as ammonium nitrate. First, the nitrogen oxides are completely oxidized and the mixture of NO and NO2 is washed with ammonium nitrate solution of fixed maximum and minimum ammonia content, i.e., a maximum water vapor: ammonia ratio of 2:1 and a minimum ratio of 100:1. The ammonium nitrite-containing solution obtained is converted into ammonium nitrate solution with the help of nitric acid. The concentration of ammonium nitrate in the solution should be so high that its viscosity is equal to or greater than that of water at the same temperature; at a working temperature of 20-30 C, this concentration should be from 40 to 50% by weight. There should be at least two, and prefereably three or more washers and the solution passing through the scrubbers should contain at least 0.5-5% by wt free ammonia. Each washing stage in the gas washer installations should have its own inlet and outlet so that they are connected in series in the direction of gas flow and in parallel in the direction of solution flow. The degree of oxidation of the gas, after passing through half or 2/3 of the washing stages, is corrected to 50%. A washing stage with mild nitric acid should be added after the washing stages with ammonia. The nitric acid content of the ammonium nitrate solution is fixed to be 0.5-1.5% and never to exceed 3%. The solution is vigorously stirred after mixing with air circulation. The nitric acid ammonium nitrate solution is circulated with one or more giant air pressure pumps and cooled if necessary.

14664

Atsukawa, Masumi, Yoshihiko Nishimoto, and Naoyuki Takahashi

STUDY ON THE REMOVAL OF NITROGEN OXIDES FROM EFFLUENT STACK GASES. Mitsubishi Heavy Industries, Ltd., Tech. Rev., 5(2):129-135, May 1968. 9 refs.

Pilot plant tests of the Mitsubishi process for removing nitrogen oxides from stack gases demonstrate that nitrogen oxides can be economically reduced to less than 0.02% of gas content. By limiting threshold concentrations of nitric acid to 200 ppm or below, the method should meet the removal requirements of the major sources of nitrogen oxide emissions: metal pickling plants, nitric acid plants, chemical plants using nitric acid, nitrate, and nitrite plants. Nitric oxide is converted to NO2 by either homogeneous or catalytic oxidation, while nitrogen compounds are recovered through absorption of stack gases in wetted-wall towers packed with PVC sheets. Homogeneous oxidation is a slow process and requires large equipment. However, this equipment is easy to operate. Catalytic oxidation can be performed on small-scale equipment, but the catalyst is affected by water, dust, and mist present in the effluent gas and regeneration is necessary. The PVC equipment has a large absorption coefficient and a small pressure drop.

14727

McCarty, Bill

SMOG...OUR CITIES IN CRISIS. Trucking Business, 63(1):18-21, Jan. 1969.

Control devices and future designs are discussed which will reduce smog from vehicle emissions. Efforts were made by the Inter-Industry Emission Control Program to prolong the life of experimental anti-smog equipment by installing small computers under the hoods of 24 new test cars. The emission control hardware is a new type of catalytic converter. A computer control will divert exhaust fumes from around the converter under certain driving conditions to slow its deterioration. An international research program is seeking to find a combination of fuel and automotive hardware which will virtually eliminate emission as a problem. Computer systems are also used to evaluate exhaust emission content of light-duty vehicles. After the vehicle is plugged in, the system breaks down the chemical content of the exhaust fumes, and measurements are simultaneously printed on a graph and a typewriter. Research is being done on diesel smoke emissions, mainly on prolonging the life of smog devices. A turbine truck engine is to be marketed with predictions that it will emit far lower levels of objectionable exhaust emissions. Two smog-free power concepts are solar power and natural gas. A liquified natural gas (LNG)-powered automobile was tested and latest results confirm that LNG vehicles emit less than half as much smog-producing pollutants as the average for gasoline-fueled vehicles equipped with smog control devices.

Carbon monoxide emissions from the LNG vehicle amounted to 0.17% at the beginning and 0.21% after 42,000 miles, as compared to 1.0% at the start and 1.2% after 42,000 miles for 1968 vehicles operating on gasoline and equipped with smog control devices. The necessary engine modifications are relatively simple, and use of LNG as a motor fuel is suitable for truck fleet operations where vehicles are in constant operation and where there is a central location for servicing.

14801

Constantinescu, Mircea, Eugenia Platon, and Olga Tibrea

PROCEDURE FOR ELIMINATING OXIDES OF NITROGEN FROM GASES USED IN AMMONIA SYNTHESIS. (Procedeu de eliminare a oxizilor de azot din gazele folosite la sinteza amoniacului). Text in Romanian. (Ministry of Chemical Industries, Bucharest) Socialist Republic of Romania Pat. 50557. 2p., Feb. 26, 1968. 1 ref. (Appl. March 18, 1967, 1 claim).

The patented improvement consists of adding 5-60 mg/l sodium dichromate to the wash water, one advantage thus offered being the oxidation of NO to NO2 and N2O3, which then dissolve more readily in the wash water instead of escaping into the air.

14821

Olcott, Thomas M.

DEVELOPMENT AND DESIGN OF AN ISOTOPE-HEATED CATALYTIC OXIDIZER TRACE CONTAMINANT CONTROL SYSTEM (U). Lockheed Missiles and Space Co., Sunnyvale, Calif., Biotechnology Organization, Contract NAS 1-7433, NASA CR-66739, 277p., Feb. 28, 1969. 79 refs.
N 69-18755

The development and design of an isotope-heated catalytic oxidizer trace contaminant control system is described. The program included establishing pre- and post-sorbent bed designs to control potentially poisonous contaminants (e.g., H2S, NO2, SO2, and NH3) and to control contaminants that might produce undesirable products. Lithium hydroxide was selected as the pre-sorbent material. The sizing of the pre-sorbent bed was accomplished by establishing the stoichiometric quantity of lithium hydroxide required to remove the poisonous contaminants and by establishing a satisfactory dynamic performance level. A trade-off was made between the weight penalty due to the bed and canister fixed weight and the weight penalty associated with the fan head rise required for flow to establish the bed configuration. To determine the pre-sorbent bed requirements, a regenerative charcoal main sorbent bed system, suitable for the proposed program, was postulated, and its effect on the contaminant load was assessed. A 180-day evaluation test of the pre-sorbent bed, catalytic oxidizer, and post-sorbent bed was conducted. Tests established the fabrication and joining techniques and the compatability between

the isotope heat source materials of construction. Additional tasks included evaluation of candidate electric heater concepts for use in a simulated isotope heat source and evaluation of thermal insulation concepts. The insulation performance was better than expected and resulted in the reduction in the required insulation thickness from 1.5-1.0 inches. Solid insulation was selected for the final design. The detailed design of the isotope heated catalytic oxidizer system included a stress analysis of the main structure and a review of the thermal characteristics. The resistively heated unit is an exact duplicate of the radioisotope-fueled unit, except that the thermal power is obtained from a resistively heated element located in the fuel cavity, and heater element and thermocouple leads pass through the heat exchanger core. (Author abstract modified)

14902

Andersen, L. B. and H. F. Johnstone

GAS ABSORPTION AND OXIDATION IN DISPERSED MEDIA.
Am. Inst. Chem. Engrs. J., 1(2):135-141, June 1955. 8 refs.

The absorption and subsequent liquid-phase reaction of oxygen was studied with two types of dispersion apparatus: the Venturi atomizer and the fritted-glass disperser. The systems studied in both devices included the absorption of atmospheric oxygen by catalyzed sodium sulfite solutions and the simultaneous absorption of atmospheric oxygen with nitrogen dioxide and with sulfur dioxide by water. Very large values of the liquid-film mass transfer coefficient for oxygen absorption were measured in the atomization zone of the Venturi atomizer. Over-all recovery efficiencies were less than 2.3% for nitrogen dioxide but reached as much as 22% for sulfur dioxide. Oxidation efficiencies for sodium sulfite solutions ranged up to 80%, depending on the operating conditions. The fritted-glass disperser gave recovery efficiencies of nitrogen dioxide as high as 90% from air containing 10% of the gas. The recovery efficiency decreased at low concentrations of nitrogen dioxide for both the Venturi atomizer and the fritted-glass disperser. (Author abstract modified)

14955

Rabson, S. R.

THE DEVELOPMENT OF AN EXTRACTION PLANT FOR THE ELIMINATION OF BLASTING FUMES. South African Institute of Mining and Metallurgy, Johannesburg, Trans. Seventh Commonwealth Mining and Metall. Cong., vol. 2:759-774, 1961. 20 refs.

Nitrous fumes produce acute toxic effects and, when inhaled in gross concentrations together with siliceous dust, can accelerate the development of silicosis. Methods for extracting the oxides of nitrogen from fumes caused by underground blasting

were investigated. A detailed description is given of laboratory work to analyze the composition of fumes released in blasting; the fumes were found to contain nitric oxide, nitrogen dioxide/ tetroxide, and nitrogen trioxide, with nitric oxide being the most significant for the problem of fume elimination. Both laboratory extraction tests and underground oxidation tests were carried out; the most successful results were obtained with a combined method of simultaneously oxidizing the nitric oxide and absorbing the oxidation products. An extraction plant was developed, based on the use of alkaline potassium permanganate solution impregnated on vermiculite; the performance of the trial filter showed the effectiveness of a single vermiculite bed, at least 2 ft thick, impregnated with a solution of 5% $NaCO_3$ and 5% $KMnO_4$ in oxidizing and absorbing the nitrous fumes; extraction is good up to 55 f.p.m. Because the bed loses a considerable portion of its absorbing power after extended use, the air should be by-passed during normal ventilation between blasts to reduce decomposition of the permanganate by the air. Despite the good extraction obtained, air from the filter should still be mixed with ventilating air to a dilution of not less than 5 to 1 before supplying the air to working places. The design of a suitable fume extraction plant is described.

14975

Lee, R. C. and D. B. Wimmer

EXHAUST EMISSION ABATEMENT BY FUEL VARIATIONS TO PRODUCE LEAN COMBUSTION. Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1968. 15 refs. (Presented at the National Fuels and Lubricants Meeting, Tulsa, Okla., Oct. 29-31, 1968, Paper 680769.)

Differences in the power producing capacities and exhaust emission characteristics of various spark-ignition-engine fuels are frequently obscured by interactions involving the particular engine system used in the comparison. In an attempt to minimize this problem, gasoline, propane, methane, and a hydrogen-methane fuel gas were compared in a single cylinder engine under conditions that were optimum for each fuel. The resulting data, coupled with an estimated duty cycle representative of traffic service, permitted the development of internally comparable data on fuel consumption and exhaust emissions. Smog-inducing hydrocarbon emissions from the exhaust of a propane-fueled engine can be less than 13% of the minimum value obtainable with a gasoline fueled engine. Such emissions would be substantially eliminated with a well designed methane engine. Engines designed for propane and methane should have substantially no carbon monoxide in the exhaust, and only 40-50% as much nitric oxide as an engine designed for gasoline. In addition, lower specific fuel consumptions are possible with propane and methane. These benefits are primarily the result of better lean combustion performance with the two gaseous fuels. It is recognized that a fuel gas that might be steam-reformed from a liquid fuel would have even better lean mixture combustion behaviour and lower emissions than propane or methane. (Author abstract modified)

15087

Mucskai, Laszlo

THE PROCESS OF OXIDATION OF NITROGEN OXIDES IN THE PRESENCE OF EQUIMOLECULAR NO + NO2 ABSORPTION IN THE DILUTE TAIL GASES OF NITRIC-ACID PLANTS. (Nitrogenoxid oxidacioja hig nitrozus gazoktan ekvimolekularis NO + NO2 folyamatos abszorpcioja mellett). Text in Hungarian. Magy. Kem. Polyoirat, 67(11):498-490, 1961. 1 ref.

A differential equation is derived that gives the incremental change in the partial pressure of nitrogen dioxide as a function of incremental change in nitric oxide concentration, oxygen concentration, the concentration of an inert gas, and the total pressure. The above conditions refer to the tail gas of a stack at a plant where nitric acid is manufactured from nitric oxide, sodium carbonate, and water; the tail gas (NO and NO2) concentration is 0.7-1.0 vol%. Subsequently, the equation is used tc derive another differential equation rendering the time needed to accomplish an incremental change in NO concentration. This latter differential equation is considerably simplified so that it can be integrated. The resulting equation is presented in the form of a nomogram that can be used to calculate the volume of the absorber column or the oxygen concentration or the time needed to perform the reaction.

15100

Szepesy, Laszlo and Allesandro R. Giona

REMOVAL OF TRACE AMOUNTS OF NITRIC OXIDE BY ADSORPTION. (Kis mennyisegu nitrogen-monoxid eltavolitasa adszorpcioval). Text in Hungarian. Magy. Icem. Folyoirat, 71(9):399-403, Sept. 1965. 6 refs.

The presence of 0.1-0.8 ppm nitric oxide during the nitrogen washing of synthesized ammonia might result in an unexpected and powerful explosion. This study investigated the feasibility of NO removal by adsorption and selection of the most suitable adsorbent. For the test work, NO was produced by Emich's method, and NO analysis was performed by the Saltzman method using a Lange Colorimeter. Three kinds of ion-exchange material (IRA 400, IMAC A 17, and IMAC C 12), two kinds of molecular sieves (5A and 13X), silica gel, and activated carbon were used as adsorbent materials; all materials were in the form of 30-40 mesh sieve fraction. Only the 5A molecular sieve and the activated carbon (Carlo Erba, Norit) gave appreciable breakthrough times. Test results of dynamic adsorption measurements are presented for the two chosen materials, giving the velocity of progression of the adsorption zone as a function of NO concentration and linear gas velocity, and the adsorption isothermal lines in the investigated concentration regime (0-13 and 24 ppm) for activated carbon.

15152

Schwanecke, Rudolf

WASTE GAS CLEANING THROUGH COMBUSTION OF NITROGEN OXIDES. (Abgasreinigung durch Verbrennen von Stickstoffoxyden). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 19(9):262-264, 1969. 3 refs.

Various methods for elimination of NO and NO2 from waste gases are reviewed. Absorption of the nitrogen oxides on silica gel has recently interested the nitric acid plants. Water vapor is used for desorption, and the recovered nitrogen oxides are returned to the nitric acid plant. If no recovery of the nitrogen oxides is desired, they can be removed from waste air by scrubbing with water or bases such as sodium hydroxide or ammonia water. The reaction follows the equation 3NO2 + H2O yields 2HNO3 + NO. As can be seen, only NO2 is removed. A patented process for dissociation of NO and NO2 in the reducing part of the flame is based on the reaction of carbon monoxide with NO2 and NO in a flame sustained in an atmosphere of low air. The reaction follows the equation 2NO + 2CO yields N2 + 2CO2. It has also been discovered that the nitrogen oxides dissociate in an atmosphere of 20% or more excess air. The process depends on the thorough mixing of the gases with the flame, as accomplished by atomization. In a chemical plant, NO and NO2 are eliminated by a combination of scrubbing and combustion. Nitric oxide escapes from the scrubber at a rate of up to 30 cu m/hr with a temperature of 30 C. It is mixed with air and atomized with the fuel oil in a muffle furnace; it serves as combustion air and as an atomizing agent for the fuel oil. About 3 to 5 ppm of NO and NO2 were measured in the waste gas of the furnace.

15249

Girden, Barney B.

METHOD OF CONTROLLING SMOG. (Assignee not given.) U. S. Pat. 3,465,964. 4p., Sept. 9, 1969. 2 refs. (Appl. Nov. 9, 1964, 3 claims).

A method for controlling and substantially eliminating smog is directed toward effecting the ascension above coastal cities of thermal inversion belts which trap and retain pollutants near the surface of the earth. On-shore breezes which cause a thermal inversion belt to rise can be initiated and sustained by mixing cool, deep offshore water with warm surface water to reduce the temperature of the surface water to a value less than that of the adjacent earth surface. When the thermal inversion layer ascends, the cool, clean, and heavier oceanic atmosphere can then be substituted for the warmer, lighter, and polluted air by the phenomena of thermal convection. The invention proposes to achieve the turbulent intermingling of ocean water by installing pumping apparatus in selected submarine canyons bordering coastal areas. It has particular

implications for Southern Califcrnia, where a chain of submarine canyons and basins are located adjacent to the coastline. Best results will be cbtained by initiating the on-shore breeze just before smog occurs, that is, in the early morning hours when the temperature of the earth"s surface usually decreases to a point lower than that of the ocean.

15270

Schmidt, Karl-Heniz

METHOD FOR REMOVING NITROGEN OXIDES FROM GASES THROUGH CATALYTIC REDUCTION OF THESE SUBSTANCES TO NITROGEN. (Verfahren zur Entfernung von Stickoxyden aus Gasen durch katalytische Reduktion derselben zu Stickstoff). Text in German. Hamburg Gaswerke, G.m.b.H., Hamburg) W. German Pat. 1,259,298. 2p., Jan. 25, 1968. 1 ref. (Appl. Aug. 29, 1964, 2 claims).

A method for removing nitrogen oxides from waste gases, flue gases, etc. involves catalytic reduction of these oxides to nitrogen at high temperatures in the presence of ammonia cr compounds which liberate ammonia. Appropriate catalysts are oxides of the sixth to eighth subgroup of the periodic table of elements. Because these catalysts are resistant to sulfur, sulfur-containing gases, primarily flue gases, can be freed of their nitrogen oxides. Chromium and/or iron oxides are particularly effective catalysts. The reaction follows the equation NO2 + NO + 2NH3 yields 2N2 + 3H2O. The reaction temperature can range from 150 tc 300 C; about 250 C is preferred for dry gas and above 300 C for very moist gas. The advantages of this method are that (1) any concentration of NO and NO2 is removed ccmpletely, even when sulfur is present, (2) no scrubbing process is necessary, (3) no by-product accumulates, and (4) the nitrcgen oxides are converted in oxidizing atmosphere. Two practical examples are given. In the first case 250 kg catalyst were used per 300 cu m flue gas/hour. The dirty gas had a NO content of 120 ml/cu m and a NO2 content of 15 ml/cu m. After catalytic reduction the nitrogen oxides concentrations were less than 0.01 ml/cu m. In the second case the gas contained 3000 ppm which were reduced to less than 0.1 ppm.

15271

Andersen, Holger C.

CLEANING OF INDUSTRIAL GASES WITH PRECIOUS METAL CATALYSTS. (Industrielle Gasreinigung mit Edelmetallkatalysatoren). Text in German. Dechema Monograph., 40(616-641):325-33, 1962. 28 refs.

The applications of platinum metals as catalysts for removing acetylene from olefins, cleaning coke-oven gas, and treating residual gases from the nitric acid production are reviewed. Of the family, platinum palladium is particularly suited for the

hydration of acetylene so that only a few ppm remain. Recent laboratory tests indicate that at gas throughputs of up to 4500 standard cu m/hr/cu m catalyst, the addition of hydrogen can be reduced to a mole ratio between hydrogen and acetylene of 2. In the case of coke-oven gases, acetylene, nitrogen oxides, carbon oxysulfide, and diolefins are converted into harmless, easily removable compounds by palladium and ruthenium catalysts. Catalytic treatment of residual gases from nitric acid production has three goals: the removal of noxious components, recovery of the nitrogen in pure form for re-use at the ammonia synthesis, and production of heat. Recent laboratory tests show that the process can reduce the nitric oxide content of waste gases to 9 ppm.

15321

Eberan-Eberhorst, R.

FORWARD-LOOKING EXHAUST GAS RESEARCH FOR THE AUTOMOTIVE PETROL ENGINE. (Abgasforschung zukunftsweisend fuer den Fahrzeug-Otto-motor). Text in German. Motortech. Z. (Stuttgart), 30(9):315-323, Sept. 1969. 18 refs.

The influence of engine operation modification on the emission of such exhaust gas components as CO, hydrocarbons and nitrogen oxides is discussed. The use of an evaporator helps reduce carbon monoxide emission to the lowest possible concentration. A spinning motion in the air intake pipe also reduces the CO content. The type of carburetion has almost no effect on the CO or hydrocarbon emission. Study of the influence of temperature cooling agent on hydrocarbon emission showed that emission could be considerably reduced by raising the temperature of the agent. When the engine acts as a brake, hydrocarbon emissions jump to high concentrations due to misfiring. Spiral-like intake pipes or vortex-imparting installations in the intake system, tangential inlets or deflector valves have a considerable influence on hydrocarbon emission, which is decreased because the wall layer is completely burned due to the higher turbulence. This however, costs power. Compression of the intake air and spark timing also reduce these emissions. With a commonly used idling mixture containing 3% CO, the hydrocarbon emissions of a 1-liter four cylinder engine were reduced from 1720 ppm at 30 degree ignition advance to 180 ppm at 18 degree ignition delay. The emission of nitrogen oxides can be reduced by exhaust gas return to the fresh air which reduces the caloric value of the fuel/air mixture and by water injection into the intake pipe. Tests with the latter method showed that nitrogen oxide emissions could be reduced from 2000 ppm to 583 ppm. At lamda equal to one, a 20% addition of exhaust gas has the same effect as water injection at a water to fuel ratio of 1:2.

15640

Sullivan, Billie R.

SMOG REDUCING CARBURETOR. (Autorctive Development Corp., Calif.) U. S. Pat. 3,471,132. 6p., Oct. 7, 1969. 11 refs. (Appl. Dec. 14, 1967, 9 claims).

A venturi-less carburetor is described in which the movement of the throttle valve controls the rate of fuel discharge and in which fuel is discharged into the engine induction system through the throttle valve shaft. The carburetor embodies several features for improving combustion in internal combustion engines and for reducing the emission of smog-producing constituents from the induction system. The smog-reducing features include an accelerating pump with a discharge circuit responsive to an induction system vacuum for bleeding fuel into the carburetor during severe decelerations, an improved fuel discharge nozzle bar, and a system for retarding the spark advance on such decelerations. (Author abstract modified)

15650

Case, Carl D., Daniel L. Bear, and Tunis Shrewders

PURIFICATION METHOD OF GAS CONTAINING NITROGEN OXIDES. (Chisso sankabutsu o ganyu suru gasu no seiseiho). Text in Japanese. (Engelhard Industries, Inc., Newark, N. J.) Japanese Pat. Sho 44-13002, 13 p., June 11, 1969. 3 refs. (Appl. March 18, 1965, claims not given).

In the production of nitric acid, harmful gases such as nitric oxide or nitrogen dioxide are produced. To prevent air pollution, nitrogen oxides must be eliminated completely from the final product. One way of eliminating the gases is by catalytic reduction, using reducing agents such as hydrogen, carbon monoxide, and so forth. In this invention, excessive back pressure, occurring in the conventional process using granular catalysts, and wear loss of expensive platinum metal catalysts are reduced to a minimum. The catalyst consists of a ceramic having more than one ditch for gas flow extending along the flow direction. The ceramic has pore diameters of 2000 A and is supported on outer surfaces opening into the ditches. Refractory metal oxide which has a surface area of at least 25 sq m/g precipitates on the ditches and also on the outer surfaces. Platinum metals precipitate on the refractory metal oxide. Several practical examples are shown for the terminal gas containing 0.9% nitric oxides. The nitric oxide content was lowered to 1 ppm. Pressure decrease was 0.508 (1.52) atm under 40,000 Vg/Vc/hr, 0.762 (5.33) under 10,000 Vg/Vc/hr, and 1.52 (14.2) Vg/Vc/hr, where Vg/Vc/hr means volume of gas per catalyst volume per hour. The values in parentheses are for a catalyst having a diameter of 0.635 cm.

15772

Okuno, Tosihide

THE REACTION BAD ODOR SUBSTANCES WITH OZONE. (Akushu seibun to ozon no hannosei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(8):633-639, Aug. 15, 1969. 8 refs.

The removal of industrial odors by the use of ozone oxidation was studied, and their properties and behavior were described with the

introduction of electron theory. Malodorous components are amine-ammoniacal compounds, lower aliphatic acidic compounds, sulfurous compounds, olefin-paraffin hydrocarbons, and other organic compounds. Olefinic hydrocarbons have a characteristic odor and a reaction mechanism for olefinic hydrocarbons and ozone was described. One of the most general reactions of the carbon-carbon double bond is an addition of ozone and rearrangement of the resultant ozonide whereby the ozonide is directly hydrolyzed by boiling with water. Secondary and tertiary amines were employed to examine reactivity and reaction products. Reactivity was determined by measuring residual ozone quantity, and reaction products were monitored by gas-chromatography. Tertiary amines reacted extensively with ozone and formed various compounds. Acrylic ester monomer, used as a raw material of acrylic acid resin, is very odorous. An oxidation experiment using acrylic ester and methacrylate was done for the removal of this odor. Acrylic ester reacted faster than methacrylate; a reaction of acrylic ester with ozone proceeded relatively fast, so this odor can most readily be removed by selecting appropriate reaction conditions. In conclusion, not all odorous components can be removed by ozone oxidation, due to the difficulty in reducing 1 ppm of malodorous components to 1 ppb (99.9% removal rate). Optimum reaction conditions and apparatus must be found for the use of ozone reaction methods on odorous sources.

15941

Tow, Philip S.

CONSIDERATIONS OF THE FEASIBILITY OF CONTROL OF OXIDES OF NITROGEN. J. Air Pollution Control Assoc., vol. 7:234-240, Nov. 1957. 28 refs.

A review of existing theories of the role of nitrogen oxides and hydrocarbons in ozone and smog formation is followed by a consideration of the nature and contribution of various sources of nitrogen oxides in Los Angeles County and an evaluation of methods for controlling the oxides. In Los Angeles, nitrogen oxide emissions are primarily the result of nitrogen fixation in combustion processes, according to the equilibrium N2 plus 02 equals 2NO. Variables in combustion processes are temperature, excess air, and in the case of automobiles, engine acceleration rate. Theoretical and experimental data show that there is no ready solution for the control of nitrogen oxides as a general atmospheric contaminant. Much experimental work needs to be done before satisfactory devices are developed. The importance of research on the catalytic decomposition of nitric oxide is stressed. It is also suggested that methods of accelerating vapor phase reactions of NO may have applications for controlling nitrogen oxide emissions from stationary sources. Other possible methods of control discussed are absorption, adsorption, and changes in the design of combustion equipment or its operation or changes in fuel.

15948

Nakano, Toshihiro

THE EXAMPLE OF ODOR CONTROL WITH OZONE. (Akushuh taisaku to shite no ozon riyo no jissari rei: Nagoya shi Horidome shorijoh ni okeru ichi rei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(6):359-363, June 15, 1968. 6 refs.

Deodorant and ventilation facilities at a sewer treatment plant at Horidome, Nagoya city are described. The volume of air treated is 11,910 cubic meters. The air can be changed eight times an hour, since the ducts and ventilator handle 1600 cu m per min. Because the sewer odor is a mixture of many gases, its analysis is difficult. Among the principal ingredients are hydrogen sulfide, indole, skatole, and ammonia. Deodorizing methods considered were adsorption, absorption, masking, counteraction, combustion, autotrophy, and oxidation. Because of space limitations, the method of oxidation by ozone was chosen. The amount of ozone required is about 1 ppm, i.e., 1.75 mg per cu m air. Total ozone used is 168 gr per hour. The amount of raw material is 269 liters air per min, and the rate of ozone generation is 7.6 liters per min. Four seconds are required for the mixing of odor and ozone. The reaction takes place in the exhaust duct of the ozone generator. Operating costs of the process are 104,520 yen ($290) per year. Ammonia has decreased about 60 percent. Other components can not be measured because of their low concentration. Factors affecting the continuous operation of the ozone generator will be reported later.

16157

Kipot, N. S., A. I. Brodovich, and B. S. Filippov

REMOVAL OF NITRIC OXIDE FROM COKE-OVEN GAS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 3:38-43, 1969. 47 refs.

Although the amount of nitric oxide in coke-oven gas is small, even the slightest trace reduces the efficiency of equipment for fertilizer manufacture and creates the risk of explosion. Current methods of nitric oxide removal are those that involve compression of coke-oven gas or those that are carried out at normal pressures (800-1000 water guage). When the compression method is carried out in hollow reactors, 70-90% of the nitric oxide can be removed at 100 C and 10-12 atm. When carried out with molybdenum or tungsten sulfide catalysts, nitric oxide is virtually entirely removed at 180-250 C and 16 atm. The best available method for removing nitric oxide from uncompressed gas is purification in electrostatic brush-discharge precipitators. In this process, nitric oxide is oxidized inside the precipitator, on an almost stoichiometric basis, to nitrogen dioxide. The nitro-resins formed by the reaction of the nitrogen dioxide with the unsaturated hydrocarbons present in the gas are speedily deposited inside the precipitator. The nitric oxide content of

the coke-oven gas is reduced from 0.5 to 0.006 ppm. This method should receive further study in the Soviet Union where the introduction of smokeless coke has increased the nitric oxide content of coke-oven gas.

16233

Kingston Chemicals Ltd.

MANUFACTURE OF NITROUS OXIDE. APPENDIX II. Brit. J. Anaesthesia, vol. 39:443-444, May 1969.

Production of pure nitrous oxide by the closed circuit method is described. Ammonium nitrate is liquified in a preheating retort by gas cylinders and then transferred to the main retort which is heated only until the nitrate is able to generate its own heat. The pressure in the main retort pushes gas through a purification system, eliminating the risk of impurities being entrained in the system. After partial cooling, the gas is scrubbed with caustic soda and passed through beds of finely divided iron where nitrogen dioxide is removed and nitric oxide reduced to nitrous oxide. The gas is then passed through sulfuric acid, a water scrubber, and is dried by lump caustic before entering a gasholder designed to balance the rate of gas produced and the rate of gas compressed. From the compressors the gas passes through another bed of finely divided iron and additional lump caustic. It is liquified by cooling. The cylinders to which the liquid is passed are overfilled by approximately six pounds of liquid and allowed to stand before being 'blown back' to the required weight. This eliminates the more volatile impurities: nitrogen and nitric oxide.

16299

Schwanecke, R.

ELIMINATION OF NITROGEN OXIDE BY MEANS OF COMBUSTION. (Vernichtung von Stickstoffoxid durch Verbrennen). Text in German. Wasser, Luft Betrieb, 12(6):372-3, June 1968. 3 refs.

The elimination of NO and NO2 by scrubbing with water or sodium lye and their elimination by thermal decomposition are briefly contrasted. The former method has the disadvantage of just removing the NO2 according to the equation 3NO2 + H2O yields 2HNO3 + NO. Thermal decomposition of NO and NO2 between 150 and 620 C in a reducing flame maintained with a lack of air follows the equations 2NO + 2CO yields 2N2 + 2CO2 and 2NO2 + 4CO yields N2 + 4CO2. The oxides are also reliably destroyed at 20% and more excess air. A third method for eliminating NO and NO2 is discussed in greater detail. It is a combined process of absorption of NO2 and combustion of NO. The waste gases of a chemical oxidation process are first passed countercurrent to a scrubbing liquid through a scrubbing tower, where the NO2 is converted to nitric acid. The NO which escapes from the scrubbing tower is mixed with the threefold amount of air and burned in an oil-fired ruffle furnace. The furnace consists of two concentric, sheet steel

shells. In the space between the two shells cooling air is circulated with a speed of 12 m/sec. The nitrogen oxide-containing air is used for atomizing the fuel.

16341

Schischkov, D., M. Kojcharova, D. Iwanov, Z. Galunski, G. Dimov, K. Gruev, and D. Grueva

A STUDY OF THE CONVERSION OF CARBON MONOXIDE AND THE SIMULTANEOUS REMOVAL OF NITRIC OXIDE AND OXYGEN FROM THE SYNTHESIS GAS WITH THE AID OF LOW-TEMPERATURE CATALYSTS. (Studie ueber die Konvertierung von Kohlenoxid und die gleichzeitige Entfernung von Stickoxid und Sauerstoff aus Synthesegas mit Hilfe von Tieftemperaturkatalysatoren). Text in German. Allgem. Prakt. Chem. (Vienna), 20(3):68-70, 1969. 8 refs.

Tests with low-temperature catalysts developed by the Technological Institute of Sofia concerning the conversion of carbon monoxide were performed in an experimental plant with a capacity of 20 standard cu m per hour. The synthesis gas contained 88% hydrogen, 3.5% nitrogen and argon, 5.4% carbon monoxide, 2.5% methane, 0.6% carbon dioxide, up to 5 mg/hydrogen sulfide/cu m, 0.5 ppm nitric oxide, and 1000 ppm oxygen. The pressure at the activity tests was 28 to 29 atm gauge; the throughput speed, 2000 to 5000 cu m/cu m/hr; the steam/gas ratio, 0.5; and the temperature less than 250 C. With all types of catalysts tested, the same carbon monoxide concentration was obtained. The throughput speed exerts considerable influence at low temperatures on the residual carbon monoxide concentration; at higher temperatures, this influence becomes weaker. The catalysts were able to reduce nitric oxide and oxygen considerably, which means that they are able to convert and clean the synthesis gas in one process.

16365

Tuerkoelmez, S.

NEW METHOD OF WASTE GAS CLEANING. ELIMINATION OF ODORS THROUGH EXCHANGE ADSORPTION WITH ARTIFICIAL ION EXCHANGERS. PART II. (Neues Verfahren der Abgasreinigung. Beseitigung der Geruchbelaestigungen durch Austausch-Adsorption mittels Kunstharz-lonenaustauschern. Teil II). Text in German. Wasser Luft Betrieb, 9(12):812-816, 1965.

Experiments in the laboratory and in a pilot plant were conducted with waste gases containing nitrogen oxides. Removal by exchange adsorption with artificial resins (such as amberlite IRA-410 and IR-45) using air or nitrogen as the carrier gas showed that the capacity of the resins was lower in the presence of air. For 1 kg nitrogen gas, 27 l amberlite IRA-410 were needed. Tests on the stability of the artificial resins by saturation in 15% nitric acid for 132 days brought positive results. Experiments with various scrubbing liquids such as water, sodium lye, and dimethylsulfoxide showed that the scrubbing process, which is actually an oxidation process, is improved by the presence of

sufficient oxygen. Eleven tests with dimethylsulfoxide solution were performed. The waste gas was first cooled to 20 C and then passed over dimethylsulfoxide solution. The solution was regenerated over artificial resins which bound the HNO3 and possibly also the HNO2 through exchange adsorption. The efficiency of this method was between 80 and 98%. For regeneration of the scrubbing liquid, 300 liters of artificial resin per week were needed. The resins in turn had to be regenerated once a week with 10% sodium lye. During the experimental period, the resins suffered no decline in capacity.

16555

Fukui, Syozo

EXAMPLES OF GAS INJURY BY HYDROFLUORIC ACID AND NITROGEN DIOXIDE, AND REMOVAL OF THE GASES FROM WASTE GAS. (Fukka suiso oyobi nisanka chisso ni yoru kogai to sono jogai jisshirei). Text in Japanese. Kogai to Taisaku, (J. Pollution Control), 2(7):481-486, Aug. 15, 1966. 3 refs.

Among the methods of nitrogen-dioxide removal, washing by water or alkaline solutions are only 50% effective. The author investigated a method based on ammonia gas. For the sake of comparison, an experiment using water alone was conducted. Nitrogen dioxide concentration was about 200 to 300 ppm; gas velocity, 0.6 l/min; and water volume, 20 ml. Removal efficiency was only 30 to 40%. Next, washing by a caustic soda solution was examined. The caustic soda concentration was 10% under identical experimental conditions. The rate of removal was 40 to 50%. The rate of nitrogen dioxide removal by ammonia was 85 to 95%. The drawback of this method, however, is that it generates white smoke of ammonium nitrite or nitrate. In the experiments conducted at a plant site, washing by water removed only 12 to 55% nitrogen dioxide while ammonia removed 70 to 93%. Hydrofluoric acid is harmful to silkworms. Mulberry leaves containing 1 mg of fluorine per 100 g of leaves completely killed silkworms. Elimination of hydrofluoric acid was comparatively easy. Satisfactory results were achieved by alkaline washing. The removal rate of this method was higher than 99% and the acid concentration of tail gas was lower than 1 ppm. The mortality rate of silkworms fed untreated mulberry leaves was 3.0 percent; that of controls was 2.0.

16691

Ladu, M., M. Pellicioni, and M. Roccella

PRODUCTION AND DISCHARGE OF TOXIC AND RADIOACTIVE GASES IN THE 'LINAC' TUNNEL IN FRASCATI. (Produzione e scarico di gas tossici e radioattivi nel tunnel del Linac di Frascati). Laboratori Nazionali di Frascati del CNEN, Italy, LNF-65/21, Nota interna: no. 282, 12p., June 28, 1965. 8 refs. Translated from Italian. National Research Council of Canada, Ottawa, National Science Library. T.T. 1332.
CFSTI: N 69 10248

Among the hazards associated with high-power linear accelerators are the production of NO2 and O3 plus the nuclides C 15, N 11, and Cl 38. For the sake of production and the safety of personnel, production of the gases and nuclides in the Frascati Linac tunnel was calculated. Results show that the maximum allowable concentrations of the gases are reached in approximately 20 min. If the air in the tunnel is changed every 10 minutes, concentrations can be kept below the admissible levels. This can be accomplished by ventilation on the order of 60 cu m/min. Production of the nuclides is less than 20% of the allowable maximum, which for lungs is 4 rem in 13 weeks, corresponding to the value 7 to 0.001 rad/hr for 40 hrs/week. Radiation levels at points where radioactive gases are discharged do not appear to be serious.

16699

British Oxygen Co. Ltd., Glasgow, Scotland

CURRENT METHODS OF COMMERCIAL PRODUCTION OF NITROUS OXIDE. APPENDIX 1. Brit. J. Anaesthesia, vol. 39:440-442, May 1967.

Nitrous oxide is produced on a commercial scale by passing an ammonium nitrate solution through a primary scrubbing tower to a gas-heated reactor. As decomposition takes place, nitrous oxide leaves the reactor, together with steam, ammonia, nitric acid, nitrogen, and traces of nitric oxide and nitrogen dioxide. Initial cooling of the merging gases causes most of the ammonia and nitric acid to revert to ammonium nitrate, which is returned to the reactor. Residual ammonia and nitric acid are removed by a water scrubber; higher oxides, by caustic/permanaganate scrubbers; and ammonia traces, by an acid scrubber. When free of all impurities except moisture and nitrogen, the gas is compressed and dried in an alumina drier battery. The dry, compressed gas is next liquefied to release nitrogen and evaporate pure nitrous oxide. The evaporated nitrous oxide is then compressed to cyclinder pressure and passed through a second alumina drier battery to a cylcinder filling line. In purity tests for nitric oxide and nitrogen dioxide determination, the gas leaving each drier is passed through a visual bubbler containing an acid potassium permanganate solution and a Saltzman reagent. An alarm is automatically sounded if nitric oxide and nitrogen dioxide concentrations reach 1 vpm.

16726

Kazakova, E. A., R. Z. Khiterer, and V. E. Bomshtein

PURIFICATION OF EXHAUST GASES FROM NITRIC ACID PLANTS. Brit. Chem. Eng., 14(5):667-668, May 1969.

The presence of unabsorbed nitrous gases in the tail gases from nitric acid plants created a serious pollution problem and efforts to deal with it have followed various lines. In this article a pilot plant that applies the principle of adsorption of the nitrogen oxides by a fluidized stream of silica gel particles is

described. The pilot plant consisted of an adsorption column operating at 5.5 atm and a desorber operating at atmospheric pressure. In the adsorption column, fluidized silica gel flows counter-current to the gas stream. The NO is partly oxidized to NO2 and adsorbed on the silica gel. The adsorbent saturated with NO2 is withdrawn from the adsorber base and passes to the desorption column. Here the adsorbent is heated with steam to 180 to 190 C while a current of air desorbs the silica gel. The desorption products, after dedusting in a cyclone are returned to the process.

16777

Starkman, Ernest S.

ELIMINATING EXHAUST CO AND NO - IT'S POSSIBLE. S.A.E. (Soc. Automot. Engrs.) J., 77(7):28-29, July 1969.

Direct reaction between CO and NO, when mixed in equal amounts in the presence of a catalyst, produces N2 and CO2. In the combustion process of a spark ignition engine equal amounts of both gases can be supplied to the exhaust by burning a lean fuel mixture. This requires solving the problems associated with running an engine on lean mixtures, especially mixture control so that the maximum amount of time is spent at the CC-NO match point.

17054

Starkman, E. S., R. F. Sawyer, R. Carr, G. Johnson, and L. Muzic

ALTERNATIVE FUELS FOR CONTROL OF ENGINE EMISSION. J. Air Pollution Control Assoc., 20(2):87-92, Feb. 1970. 16 refs.

The possibility of reducing carbon monoxide and nitric oxide emissions through modifications of spark ignition engine fuel composition was investigated theoretically and experimentally. Ammonia, alcohols, hydrogen, reformed hexane, and a few representative hydrocarbons were considered. Calculations of exhaust gas composition and the influence of composition on equilibrium peak cycles were based on ideal Otto cycle processes. The agreement between predicted and measured exhaust concentrations was good in the case of chemically correct mixtures. At leaner or richer mixtures, there was considerable divergence. The results show that carbon monoxide and nitric oxide concentrations are profoundly influenced by fuel composition, with the production of the pollutants determined equally by carbon to hydrogen ratio and fuel energy content. Predictions of relatively lower nitric oxide concentrations with ammonia were not confirmed. It is suggested that the nitric oxide produced by ammonia combustion is largely a consequence of oxidative pyrolysis. This is unlike the case with hydrocarbons, where the nitric oxide is formed by thermodynamic equilibrium.

17248

Watanabe, Susumu, Yukihiro Mizukami, and Tsutomu Takuma

THE SITUATION AND CONTROL OF AUTOMOTIVE EXHAUST EMISSIONS IN SAPPORO CITY. (Kanreichi ni okeru jidosha haikigasu ni yoru taikiosen to sono taisaku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(11):721-727, Nov. 15, 1968.

Data obtained by a survey of air pollution by motor vehicles in Sapporo city was analyzed. Automotive emissions are currently recognized in the city, where previously the major constituent of air pollution was smoke dust and dust fall from boilers and furnaces burning coal for heating. The recent air pollution did not appear to be consistent with smoke dust control acts with a main purpose of promoting the use of smokeless fuel and cokes instead of coal and controlling large boiler furnaces. The number of registered vehicles in 1967 doubled the amount in 1962 and fuel demand was about 4 times the amount in 1962. The amount of traffic at major intersections was estimated to be 15,000 to 35,000 vehicles, which shows an increase of 2.4 times that of five years ago. Roads are also poorly paved and traffic is delayed in winter due to heavy snow. The automotive exhaust emissions, carbon monoxide, sulfur dioxide, nitric oxide, nitrogen dioxide, and airborne dust do not indicate high densities despite the traffic increase; but at intersections in main streets, a high density was measured. The result of a control device tested on slow throttle timing of an engine system showed a decrease from 20% to 14% of CO exhaust emissions and in a secondary test, the figures decreased to 4.3% of average CO exhaust emissions. Countermeasures which are now planned to control automotive emissions involve composition of a Motor Vehicle Exhaust Control and a Noise Block Council, research on control devices appropriate for cold weather, and promotion of road heating to solve the traffic delay in the snow season.

17262

Yanagihara, Shigeru

AIR POLLUTION AND FUTURE AUTOMOBILE ENGINES. (Kogai mondai to shorai no gendoki). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 23(11):1174-1183, 1969. 7 refs.

The prospects for reducing emissions from internal combustion engines or developing alternative engine systems are reviewed. Internal combustion engines, which include Otto, Diesel, and Brayton cycles, are divided into reciprocal and rotary types. The engines have 2 or 4 cycles or in the case of hybrid engine, a mixed cycle. Theoretically, the exhaust gas composition can be less than 25 ppm hydrocarbons, 0.25% carbon monoxide and 100 ppm nitric oxide. In practice, however, the minimum reduction attainable is twice as much, with control devices costing from $50 to $300. Replacement of the gasoline engine with other types of internal combustion engine is not realistic, and improvements in the control of exhaust gas are aimed at the

present-day gasoline engine. Gas turbines emit fewer pollutants than other prime movers, but their use, especially for vehicles less than 200 hp, is rather limited. Steam engines and stirling cycles are remote alternatives; they will not replace gasoline engines in the near future. For the electric car, an alternating-current motor is promising. Advantages and disadvantages, of lead-acid, Na-S, and Li-Cl2 cells are discussed, together with a fuel cell of H2-O2, hydrocarbons, methanol, ammonia, or hydrazine. An energy-to-weight ratio of fuels is another important factor is considering future automobiles. Gasoline or kerosene have the best value. Hydrogen has a value of 1/2 the ratio of propane, even when used as a magnesium hybrid. In conclusion, improved exhaust-gas cleaning techniques are required for the internal combustion engine.

17414

Nakajima, Keitaro and Yoshio Yamakawa

RECENT DEVELOPMENT OF CONTROL TECHNIQUES OF AUTOMOTIVE EMISSIONS. (Saikin no jidohsha haishutsu gasu seigyogijutsu). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 23(11):1164-1173, 1969. 19 refs.

Progress in automotive exhaust control from 1966 through 1969 is revieved. The main innovations in American and European automobiles are presented, followed by an explanation of the throttle positioner system developed by Toyota. In this method, the throttle valve is kept open by a certain amount during deceleration. The hydrocarbon exhaust at deceleration is greatly reduced without affecting the efficiency of engine brake. The 1970 U. S. federal regulation on auto exhuast is 30% more severe than that of 1968. New devices for meeting the current standards are reviewed. Techniques for controlling evaporation from gasoline tank and carburetor float chambers are explained in detail, since the method of sealed housing for evaporative determination is employed. A control technique for nitric oxide designed primarily to pass the California regulation in 1974 is also discussed. Devices for processing exhaust from the exhaust port are surveyed, including a reactor, afterburner, and catalytic converter. An attempt to employ extremely low fuel-to-air ratio to reduce carbon monoxide and hydrocarbons by a layered combustion is also explained. It is concluded that further research is needed in the exhaust control field.

F. EFFECTS – HUMAN HEALTH

00007

R. J. Anderson

EPIDEMIOLOGIC STUDIES OF AIR POLLUTION. Diseases Chest 42(5):474-481, Nov. 1962. (Presented at the 27th Annual Meeting, American Coll. of Chest Physicians, New York City, June 1961.)

Supplementing existing data which indicate an association between disease and air pollution, new epidemiologic studies provide evidence on the relationship of malignant neoplasms of the lung to air pollution, the distribution of deaths resulting from emphysema and the apparent increase in this disease, the relationship of asthmatic attack rates to air pollution as measured by sulphur dioxide, and the effects of air pollution exposure on pulmonary function in a normal population. Since epidemiologic studies cannot provide "cause-and-effect" proof, the author postulates that they must be supplemented by laboratory and other studies to strengthen the evidence. In order to establish "proof" that air pollution adversely affects human health, one must have: (1) statistical evidence that a certain disease condition exists in the population; (2) epidemiologic evidence of the association between this disease condition and a certain factor or factors present; (3) laboratory demonstration that such factors can produce a condition in experimental subjects similar to that found in the population; and (4) the ultimate demonstration that protection from such factors will lessen the amount or severity of the disease condition. (Author)##

00020

J. R. Goldsmith and L. H. Rogers

HEALTH HAZARDS OF AUTOMOBILE EXHAUST. Public Health Rept., 74(6):551-558, June 1959.

Of the substances which occur in automobile exhaust and their reaction products, hygienic standards have been established for industrial exposure to carbon monoxide, nitrogen dioxide, lead, and ozone. Establishing a full set of levels for community exposures to these substances is very difficult because of the sensitivity of frail or ill individuals, the indeterminate period of exposure, the effect of agents in combination, and the cumulative effect of exposure from other sources, such as cigarette smoking. The hazard of automobile exhaust to the population of a large community will depend, among other things, on the extent and way that

vehicles are used, and the meteorology of the area. In the absence of effective control for air pollution from automobile exhaust, the public health hazard should be evaluated. (Author)##

00033

H. E. Swann, Jr., D. Brunol, C. J. Balchum

PULMONARY RESISTANCE MEASUREMENT OF GUINEA PIGS. Arch. Environ. Health, 10(1):24-32, Jan. 1965. (Presented at the 47th Meeting, Federation of American Societies for Experimental Biology, Atlantic City, N.J., Apr. 1963.)

A method for measuring total respiratory flow resistance (thorax, lungs, and airways) in guinea pigs was modified for use in a long-term, day-to-day exposure of guinea pigs to the ambient air pollution of the Los Angeles basin. The principle of the method involves the use of an imposed pressure or volume change, sine wave in form and at a frequency such that the mechanical reactance is zero. At this point, the mechanical impedance is purely flow resistive, and flow resistance (R) may be expressed as a ratio of pressure (P) and flow (V) amplitude, R=P/V. The method is sensitive enough to measure acute changes in guinea pigs exposed to 5 ppm of SO2 or 5 ppm of NO2. Responses varied from animal to animal and for the same animal with repeated exposure. The response to 5 ppm SO2 was much greater than to the 5 ppm NO2. This may be due to different action of the two within the animal. The SO2 may cause constriction of the airways either by direct contact with the airways or by reflex action or both; whereas, the NO2 may only act by direct contact on the airways or the membranes of the gas exchange area. The speedy return to normal after the SO2 is stopped would tend to favor the reflex action. Inspiratory resistances decreased faster than expiratory resistances during the recovery period. This indicates constriction of the airways after SO2 exposure.##

00046

I.J. Brightman, A. Riha, Jr., S.W. Samuels

AIR POLLUTION AND HEALTH: NEW FACTS FROM NEW YORK STATE. J. Air Pollution Control Assoc., 12(6):275-281, June 1962. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1964.)

Specific evidence pointing towards a cause and effect relationship between low-grade, long-term air pollution and a growing number of diseases has mounted steadily in recent years. It is believed that the judgment of most physicians and others concerned about the pollution of the air is that a causal relationship does exist and that it is prudent to act as if this relationship has already been incontrovertibly established without waiting for all the conclusive clinical, pathological, and epidemiological evidence to be revealed. Prior to final verification, more wide-spread

acceptance of the need for prudent action in air pollution control is needed. Ir pollution should be controlled because of its potential effects upon health, particularly its influence upon the development or aggravation of chronic respiratory disorders. However, the evidence in this ccuntry is conflicting and detailed studies in the laboratory, clinical, and epidemiologic fields to attain more direct evidence are needed.##

00047

H. Heimann

THE AIR POLLUTICN PROBLEM IN THE UNITED STATES. Proc. of the Roy. Soc. Med., Symp. 6, Section II, Medical and Epidemiological Aspects of Air Pollution, 57(10-Part 2) 1000-1005, Oct. 1964.

This article gives a general review of the air pollution problems in the United States, summarizing the effects of the air pollution episodes in Donora, Pennsylvania, and Los Angeles, California. Local, state, and federal legislative efforts and the role of the Public Health Service of the U.S. Dept. of Health, Education, and Welfare in controlling air pollution are discussed.##

00084

G.J. Doyle, N. Endow, J.L. Jones

SULFUR DIOXIDE ROLE IN EYE IRRITATION. Arch. Environ. Health, Vol. 3:657-667, Dec. 1961.

An eye-irritation panel was exposed to steady-state reaction mixtures generated in a 520 cu. ft. irradiated stirred-flow reaction chamber. The reactants for one set of exposures were usually 0.2 to 2.0 ppm by colume of olefins and NO2 in purified air. Reaction residence times ranged from 1 to 2 hrs. SO2 was used as an additional reactant (at a concentration of about 0.1 ppm) in a comparable set of experiments. The reacting mixtures were evaluated for relative eye-irritating ability, with and without SO2. Aerosols derived from the co-photo-oxidation of SO2 and from SO2 itself probably have little effect on the eye-irritating ability of irradiated reaction mixtures. The net effect of the addition of SO2 to the olefin reaction mixtures is a slight decrease in eye irritation accompanied by the appearance of an aerosol. Trace concentrations of branched internal olefins, specifically 2-methyl-2-butene, and of a cyclic olefin, cyclohexene, van produce significant amounts of irritants other than formaldehyde and acrolein. While no conclusions on the identity of these irritants can be drawn from the data, it is speculated that they may be compounds of the PAN type and/or reactive or unstable reaction intermediates. The use of dynamic (stirred-flow) conditions considerably enhances the sensitivity of subjects to the irritants. Indications are that small changes in the flcw field about a subject's eyes may have large effects on response to the irritants in the

flowing air. Adding isobutane, a branched-chain paraffin having a tertiary hydrogen atom, to a photooxidizing isobutylene-NO2 mixture produced no significant effect, either on the course of the reaction or on the eye irritation. This finding held true both with and without SO2. A small decrease in eye irritation was experimentally observed, but there are not sufficient data to demonstrate that this effect is statistically significant. The rate of response to an eye irritant is a function of the chemical nature of the irritant or irritants. Ethylene and proylene, olefins important in auto exhaust, can produce significant eye irritation at realistic atmospheric concentrations.##

00100

R. E. Granda and B. Savage

HUMAN REACTIONS TO AIR ICNS. PART III: THE EFFECT OF ATMOSPHERIC IONS ON HUMAN PERFORMANCE - A FURTHER EXPERIMENT. General Electric Co. Ithaca, N.Y., Advanced Electronics Center at Cornell Univ. Jan. 11, 1963. 19 pp.
CFSTI: AD 293170

The second of 2 experiments was conducted to investigate effects of air ions on human performance. Twenty-four subjects worked on 2 psychomotor tasks under experimental stress while exposed to positive ions, negative ions, and no ions (control case). No significant differences between treatments were found. Evidence from both ion experiments strongly supports the conclusion that icns (at least up to concentrations of about 60,000 ions/cc) have no apparent effect on psychomotor performance in either stress or nonstress situations. (Authors' abstract)##

00123

F. D. McDonald, C. H. Bachman, and P. J. Lorenz

SOME PHYSIOLOGICAL EFFECTS OF AIR ION TREATMENT WITHOUT ION. (EXPERIMENT NO. 2 OF BIOLOGICAL ACTION OF IONIZED PARTICLES IN THE ATMOSPHERE.) Intern. J. Biometeorol. 9, (2) 141-7, July 1965.

A companion paper describes experiments in which only the nostrils of rats were exposed to ionized air. This paper gives results obtained from similar experiments, except that the bridge of the animal's nose was exposed to ions but inhalation of the ionized atmosphere was prevented. The heart rate was unaffected by negative air ion exposure, positive air ions caused depressed heart rate. Respiration rate was generally unaffected by ions although there was a possible final difference under negative air ion treatment. (Author)##

00132

J. M. Stolk and R. P. Smith

SPECIES DIFFERENCES IN METHEMOGLOBIN REDUCTASE ACTIVITY. Biochem. Pharmacol. 15, 343-51, 1966. (Presented in part at the meeting of the American Society for Pharmacology and Experimental Therapeutics, Aug. 1965.)

Sodium nitrite induced equivalent levels of methemoglobin in washed erythrocytes from cat, dog, and man, all suspended in Krebs-Ringer phosphate-glucose (pH 7.4). The same levels occurred in human cells with or without added substrate (glucose or lactate). In all these incubations, reduction of methemoglobin was minimal or absent over a 2-hr period. When 0.00001 M methylene blue was added with glucose, equivalent increases in rates of methemoglobin reduction occurred in the cells of all three species. Similar rates were seen in rabbit and mouse red cells even without added methylene blue, as long as lactate or glucose was present. Methylene blue further enhanced reductase activity in mouse cells but only in the presence of glucose. Rabbit cells responded much less dramatically, if at all, to methylene blue. Lysates of human, rabbit, and mouse cells were equally sensitive to nitrite, and no spontaneous reduction occurred. These findings suggest that the high reductase activity of rabbit and mouse erythrocytes is NADH-dependent. The mouse but not the rabbit appears to possess also a NADPH-dependent reductase like man, dog and cat. (Author)##

00165

M. Kleinfeld

ACUTE PULMONARY EDEMA OF CHEMICAL ORIGIN. Ind. Hyg. Rev. 7, (2) 1-10, Dec. 1965. (Reprinted from the Arch. Environ. Health 10, 942-6, June 1965.)

Six instances of pulmonary edema due to toxic exposure to ozone, nitrogen dioxide, cadmium oxide fumes, dimethyl sulfate, hydrogen sulfide and hydrogen fluoride are presented. The problems of diagnosis are discussed. In view of the unusual severity of these cases, the following points were stressed: (1) the need of the physician to be aware of the possible industrial origin in all instances where the cause of the pulmonary edema is obscure; (2) the importance of careful observation of the patient known to be exposed to an agent capable of producing a delayed pulmonary edema, even in the initial absence of any symptoms; (3) since certain of these agents, such as ozone and hydrogen sulfide, can act on the central nervous system to produce respiratory depression, it is contraindicated to administer morphine in these instances. Digitalis likewise has no place in the management of pulmonary edema caused by exposure to the chemicals mentioned. The effective treatment is primarily preventive, which calls for proper ventilation of the work environment and an adequate knowledge of the operational processes and procedures. The immediate treatment

should include the following: (1) oxygen under controlled positive pressure to the inspiratory cycle, (2) nebulized bronchial dilators for the bronchial spasm, (3) steroids in the more severe cases, (4) broad-spectrum antibictics for superimposed bacterial infection, (5) nebulized nonirritant bronchial detergents for increasing mucous secretion, and (6) tracheostomy as indicated. (Author)##

00180

J. A. Sirs

THE USE OF CARBON MONOXIDE TO PREVENT SICKLE-CELL FORMATION. Lancet 1, 971-2, May 4, 1963.

The study was undertaken to establish whether ligands such as carbon monoxide and nitric oxide would reverse sickling, and to explore the possibility of reducing the degree of sickle-cell formation in vivo by supplementing oxygen with a low concentration of CO. Both in vitro and in vivo studies are discussed. In order to study the effects of CO, a mask was placed over a patient suffering from the sickle cell disease and during the period of controlled breathing, he was given a total of 25 ml of CO, corresponding to an estimated 4% saturation of COHb in the red cells. Blood sampling revealed an initial concentration of 10.2% sickle cells with a standard deviation of plus or minus 2.5% and only 3.9 plus or minus 1.5% sickle cells after the addition of CO (P less than 0.05). A more detailed examination of this approach is suggested.##

00189

T. Dalhamn and J. Sjoholm

STUDIES ON SO2, NO2, AND NH3: EFFECT ON CILIARY ACTIVITY IN RABBIT TRACHEA OF SINGLE IN VITRO EXPOSURE AND RESORPTION IN RABBIT NASAL CAVITY. Acta Physiol. Scand. (Stockholm) 58, 287-91, 1963.

One of the factors which determine the toxicity of pulmonary irritant gases, etc., presumably is their action on the ciliated epithelium of the respiratory tract. The degree to which such gases are resorbed in the mucous layer of the respiratory passages must also be taken into account when hygienic limits and allied questions are discussed. The present paper illustrates these two factors, viz., ciliostatic action and resorption, by experiments with three common respiratory irritant gases--sulphur dioxide, nitrogen dioxide and ammonia. As regards concentration required to arrest tracheal ciliary activity in vitro, the three gases varied considerably. The degree of resorption in the upper respiratory tract also showed wide variations. It seems probable that a gas which even in low concentration rapidly impairs ciliary activity and which is resorbed to a relatively slight degree can penetrate deeper into the bronchial tree and thus, on the stated assumptions, be more toxic than gases with the reverse characteristics. (Author)##

00204

J. R. Goldsmith, L. Greenburg, A. P. Altshuller, W. S. Spicer, Jr., E. J. Cassell, and H. E. Landsberg

AIR POLLUTION AND HEALTH. Am. Rev. Respirat. Diseases, 93(2):302-312, Feb. 1966.

In order to assess the health hazards of air pollution and to cope with them, it is necessary: (1) to understand the conditions that give rise to a polluted atmosphere; (2) to have reliable and valid techniques for measuring the presence and concentration of various pollutants individually and combined; and (3) to assess the biologic effects of exposure to various forms and levels of air pollution on human organisms. The article discusses each of these aspects in detail and summarizes the established information relating to air pollution. It is suggested that current knowledge and hypotheses about air pollution health effects be used as a basis for air pollution standards and for control measures directed at specific sources of pollutant emissions.##

00228

E.C. Riley R. L. Riley

AIR CONDITIONING AND HEAITH. Arch. Environ. Health, 7(3):359-365. Sept. 1963.

The control of indoor environment (air conditioning) under the varying influences of temperature, humidity, air motion and quality is discussed. Air quality is dependent upon many factors, some of which are particulates, gases and ions. These and other factors must be taken into consideration wher making air quality measurements.##

00259

H. E. Landsberg

WEATHER AND DISEASE. Environmental Science Services Administration, Washington, D.C., Weather Bureau. (Technical Note 33-EDS-1) (#REPT. #NO. 1) #FEB. 1966. 7 PP. CFSTI

The atmospheric environment can cause sunburn, heatstroke, and frostbite. Air pollution may provoke or aggravate asthma. Weather changes often influence scar and arthritic pains. There are suspicions that the course of respiratory and certain heart ailments is influenced by atmospheric conditions. Indirectly, through influences on disease vectors, the climate plays a role in tropical diseases. Favorable climatic conditions, on the other hand, may alleviate the symptoms of various diseases. (Author's abstract)##

00281

H. Heimann, L. O. Emik, R. A. Prindle, and W. M. Fisher

PROGRESS IN MEDICAL RESEARCH ON AIR POLLUTION. Public Health Rept., 73(12):1055-1069, Dec. 1958. (Presented at the National Advisory Committee on Air Pollution, Cincinnati, Ohio, Aug. 28, 1958.)
GPO: 3303

For 3 years the Air Pollution Medical Branch of the Division of Special Health Services has been working in the increasingly more important but relatively unexplored field of air pollution in its specific relation to human health. The work began with a search for and a systematic appraisal of the scattered sources of knowledge, followed closely by tentative explorations into those parts of the problem holding promise of significant findings. Sufficiently successful results of initial activities helped chart the present course of action, which, in turn, points toward ideas requiring emphasis in the future. (Authors' abstract) ##

00284

R. A. Prindle

AIR POLLUTION AS A PUBLIC HEALTH HAZARD. Arch. Environ. Health, 4(4):401-407, Apr. 1962.

Author makes case for education on problem of air pollution. Generally alludes to diseases caused by air pollution and stresses need for community awareness and control. Author shows the trends (urban living versus rural conditions, population increase) as being directly related to problems of air pollution. Emphasis is placed upon two immediate approaches: Action program basic elements; substantially increased research into the sources and wider application of present knowledge. ##

00303

C. J. Balchum

INSTRUMENTATION AND METHODS FOR MEASURING THE PHYSIOLOGICAL EFFECTS OF AIR POLLUTION. Biomed. Sci. Instrum. 1, 39-44, 1963.

Air pollutants, noxious agents, and particles alter the function of the lungs. The prime physiological functions affected are the resistance of the airways (bronchial tubes) to air flow, the elasticity (compliance) of the lungs, and the rate of diffusion of a gas from the lungs into the blood. Methods and apparatus for making measurements of the physiological changes which occur are described, with examples of each. (Author) ##

00306

R. A. Prindle E. Landau

HEALTH EFFECTS FROM REPEATED EXPOSURES TO LOW CONCENTRATIONS OF AIR POLLUTANTS. Public Health Rept. 77, (10) 901-9, Oct. 1962.

To determine the chronic effects caused by substances polluting the atmosphere, clinical tests on man and animal were performed. Special attention has been given to SO2, NO2, photochemical smog, oxidants and CO. The effects of the individual substances as well as the combined effects were tested. Preliminary results, based on both laboratory and epidemiologic studies, show that long-term exposure to low concentrations of air pollutants results in adverse health effects. There is only qualitative evidence at present. Much more work will have to be done before the necessary quantitative answers are formed on whcih to base rational control standards.##

00307

E. C. Schoettlin E. Landau

AIR POLLUTION AND ASTHMATIC ATTACKS IN THE LOS ANGELES AREA. Public Health Rept. 76, (6) 545-8, June 1961.

During the autumn months of 1956, a study was undertaken in Pasadena, Calif., to ascertain the effect of community air pollution (smog) on persons having bronchial asthma. One hundred and thirty-seven asthma patients under the care of five physicians maintained a daily record of each of their asthma attacks for 98 days. Total atmospheric oxidants, particulates, and carbon monoxide, relative humidity and temperature, and plant damage were measured concurrently. The study indicated the peak period for attacks was midnight to 6 a.m., but the maximum oxidant levels were recorded between 10 a.m. and 4 p.m. Asthmatic attacks occurred with equal frequency among males and females. Low positive correlations were found between chemical measures of air pollution and number of persons having attacks. Low correlations were also noted for temperature, relative humidity, and water vapor pressure. A significantly greater number of persons had attacks on days with high enough oxidant values to cause eye irritation (25 pphm) than on other days as well as on days with plant damage. Of the study group, it was decided to characterize eight as smog reactors because their attacks corresponded most often to days showing plant damage. These patients showed no other common characteristic, although seven of the group were females. (Author)##

00308

H. Heimann

EFFECTS OF AIR POLLUTION ON HUMAN HEALTH. World Health Organization Monograph Ser., No. 46 (Air Pollution), p. 159-220, 1961.

As one chapter of a WHO Monograph on "Air Pollution," this paper covers the state of knowledge and world trends in research on the effects of such pollution on human health. The acute air pollution episodes in the Meuse Valley, Donora, London, and Poza Rica are reviewed. Data, causes, and effects for each episode are discussed. The symptoms of illness and organic and systemic effects resulting from major pollutants such as carbon monocide, sulfur and nitrogen oxides, ozone, beryllium, fluorides, aeroallergens, carcinogens and pesticides are described. Further research to demonstrate that specific pollutants or combinations thereof can cause ill health is urged in order to obtain data to balance health effects against economic aspects for the purpose of clearing the air. The maximum allowable concentrations for community air, published by the Russians, are considered inadequate to solve the air pollution problem. However, studies already made of the effect of low-level concentrations have been used as a base, despite controversy, to reduce pollution in many locations. ##

00310

P. J. Lawther, A. E. Martin, and E. T. Wilkins

EPIDEMIOLOGY OF AIR POLLUTION (REPT. ON A SYMPOSIUM). Public Health Papers, No. 15, 1962, 32p.

This symposium held in Copenhagen in December 1960, was attended by participants from fourteen European countries. Although in some areas current methods of control are resulting in cleaner air, in others air pollution is increasing both in the chemical complexity of its composition and in the extent of the areas affected. Motor traffic is the cause of growing anxiety in many areas because of the emission of carbon monoxide, of lead compounds, and of polycyclic hydrocarbons with suspected carcinogenic properties. Air contaminants are also discharged in wide variety in many chemical and other industrial processes and may be responsible for local problems of a specialized character. The Symposium, however, was primarily concerned with the general pollution of urban areas resulting from the use of domestic and industrial fuels, of which the most frequently used indices are dustfall, suspended matter, and sulfur dioxide. (Author) ##

00312

W. S. Spicer, Jr., P. B. Storey, W. K. C. Morgan, H. D. Kerr, N. E. Standiford

VARIATION IN RESPIRATORY FUNCTION IN SELECTED PATIENTS AND ITS RELATION TO AIR POLLUTION. Am. Rev. Respirat. Diseases 8, 705-12, Nov. 1962. (Presented at the Meeting of the American Thorac Society, Cincinnati, Ohio May 22-24, 1961 and at the Air Pollution Medical Research Conference, Los Angeles, Calif. Dec. 4, 1961.)

Authors present data from samples collected from a group of 150 patients with chronic obstructive airway disease who reside in a 40 by 20 block area in the city of Baltimore. The results obtained are as follows: (1) The patients become better and worse together. This is in the presence of possible non homogeneity of the group and strongly suggests to authors that they are influenced by something common to their common environment; and (2) It would appear that the patients physiologic changes are related to environmental factors. However, at the present the authors are unable to accept a simple cause and effect relationship with any one pollutant. Rather, this appears to be a complex problem involving combinations of factors with subtle variations around the theme of environmental changes. (Author)##

00313

R. E. Markush

ENVIRONMENTAL ASPECTS OF CHRONIC LUNG DISEASE. Preprint. (Presented to the New Jersey Tuberculosis and Health Association, Somerville, Nov. 10, 1960.)

Contents: Acute episodes-Donora, Pennsylvania, 1948; Meuse Valley of Belgium, 1930; British Isles, London, 1952, 1956, 1957; Poza Rico, Mexico, 1950; Yokohama, New Orleans, Los Angeles; chronic effects-lungs cancer; chronic bronchitis, emphysema; hay fever, asthma; and communicable diseases; Recommendations for finding a solution to air pollution problems.##

00338

J. T. Davidson, G. A. Lillington, G. Haydon, and K. Wasserman

THE ANATOMICAL AND PHYSIOLOGICAL CHANGES IN THE LUNGS OF RABBITS EXPOSED TO NO2. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-6.)

The objective of this study was to determine the effect of continuous exposure to NO2 on pulmonary function and to seek physiological elucidation of the nature of pulmonary lesions. Pulmonary function studies under general anaesthesia were carried out on 20 normal rabbits aged between 6 months and 1 year (control) and on 13 experimental animals of the same age after 3 to 4 months' exposure to NO2. In addition, some of the experimental animals were restudied 4 days to one month after the termination of the

exposure period. The overall picture which emerged from respiratory function tests on rabbits exposed to 8 to 12 parts/million NO2 continuously for 3 to 4 months, was one of severe airway obstruction with marked hyperinflation and arterial oxygen desaturation. The hypoxemia was not associated with hypercapnia and most likely was the result of abnormal ventilation-perfusion ratios associated with nonuniform airway obstruction rather than hypoventilation. Although the static pulmonary compliance recorded in the experimental animals was not statistically different from that of the controls, it tended to be reduced. A clue to the nature of the lesion associated with the physiological derangements described here, can be obtained from the results of the recovery experiments. The major and rapid reversal in airway obstruction, oxygen desaturation, hyperinflation and decreased pulmonary compliance points to an inflammatory lesion or plugging of the smaller airways by mucus rather than to the destructive process which persists after the animals are removed from the NO2.##

00339

G. C. Buell, Y. Tokiwa, and P. K. Mueller

LUNG COLLAGEN AND ELASTIN DENATURATION IN VIVO FOLLOWING INHALATION OF NITROGEN DIOXIDE. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-7.)

The conversion of excised rabbit lungs to a lipid-free powder immediately following inhalation of nitrogen dioxide is described. From this material, the structural proteins collagen and elastin were isolated by a combination of solvent extraction and enzymatic hydrolysis. From the spectra obtained by differential UV spectrophotometry, evidence is presented to show that each of the proteins underwent a change in conformation following the inhalation of one ppm NO2 for one hour. This change appears to be reversible. The relationship of respiratory function to in vivo alteration of molecular structure is discussed. (Author's abstract)##

00364

G. D. Brinckerhoff

SOLAR RADIATION AND SKIN CANCER DEATHS. Environmental Science Services Administration, Washington, D.C., Weather Bureau. (Rept. No. 1 and Technical Note 33-EDS-1.) Feb. 1966. 5 pp.

Skin cancer death rates (other than malignant melanoma) in the United States metropolitan areas were compared with data on solar radiation intensity. A statistically significant positive correlation was found but it explains only 10 percent of the variance. For more meaningful work in this field measurements of ultraviolet radiation and incidence rate of this disease complex are needed. (Author)##

00375

R. A. Prindle

AIR POLLUTION AND COMMUNITY HEALTH (CHAPTER EIGHTEEN). Medical Climatology 505-18, 1964.

In this chapter author reviews major pollution episodes which have occurred since 1930 in various parts of the world. These episodes have demonstrated the danger and the lethality that may result when certain meteorologic phenomena occur in geographical areas where potentially high concentrations of air pollutants may form. Certain pollutants that might be tolerated in low concentrations in some inhabited areas might become dangerous when mixed with pollutants from other sources that could exert an accentuating or synergistic action. SO2, particulates, CO, beryllium, lead, fluoride, photochemical, and allergenic pollutants and their effect on man and animals are discussed. The most important animal experiments as well as other research are reviewed.##

00392

Ciocco, A. and D. J. Thompson

A FOLLOW-UP OF DONORA TEN YEARS AFTER: METHODOLOGY AND FINDINGS. Am. J. Public Health 51(2):155-164, Feb. 1964.

Analyses of illness or lack of illness among citizens involved in the acute air pollution episode, Donora, Pa., in 1948 are discussed. Persons who reported acute illness at the time of the smog episode demonstrated subsequently higher mortality and prevalence of illness than the other persons living in the community at that time. Those with more severe acute illness in 1948 demonstrated greater subsequent morbidity and mortality than persons with mild complaints. Some evidence indicates that this greater morbidity and mortality is related to the cardiorespiratory system. This study of air pollution and its relationship to health and disease raised three central questions: (1) relationships among persons who first became ill or complained during the episode to those presenting prior complaints, (2) to what extent is greater morbidity and mortality a direct consequence of short-term massive exposure to air pollutants, before and after continual exposure and the two combined, (3) specific relationship of illness to the Donora pollutants. Persons with no heart disease history prior to October, 1949, who became ill had a higher subsequent morbidity rate than those who did not become ill, mortality being somewhat grater in the first group. A clear relationship between illness and environment was no established. Differential mortality, ages 21-50, indicates that smog played a role among those persons with impairments antedating the episode. Particular pollutants were not proven to be connected with specific respiratory symptoms, therefore, it was difficult to distinguish between those whose disease conditions resulted from air pollution exposure and other factors. The lack of knowledge as to which syndrome (s) results from air pollution is a vexing problem for researchers in this area. (Authors' abstract, edited)##

00428

C. H. Hine, R. D. Cavalli, and R. B. Wright

RESEARCH ON THERAPY OF PULMONARY EDEMA ASSOCIATED WITH OXIDIZERS. Hine Labs., Inc., San Francisco, Calif. (Rept. No. AMRL-TR-65-178). Nov. 1965. 40 pp.
CFSTI, DDC: AD 628 593

An evaluation was made of candidate therapeutic agents for the treatment of acute pulmonary edema resulting from nitrogen dioxide exposure. Treatments consisting of hyperbaric air and oxygen; tracheal toilet; ethyl, isopropyl, and octyl alcohol vapors; hydralazine; bethanechol; physostigmine; and isoproterenol aerosols produced no change in the mortality, survival time, or lung/body weight ratios of rats suffering from NO_2-induced acute pulmonary edema. Rutin in large doses caused a decrease in mortality and an increase in survival time of exposed rats. Intravenous infusion of isoproterenol caused a decrease in mortality in rabbits exposed to NO_2. The effectiveness of hyperbaric oxygen, hydrocortisone, rutin and bethanechol against moderate exposure to NO_2 was determined by solvent uptake measurements with rats. Oxygen administered 4 hours after exposure increased solvent uptake. There were no significant effects due to the other compounds. (Author Abstract)**

00429

A. A. Thomas

ICW AMBIENT PRESSURE ENVIRONMENTS AND TOXICITY. Arch. Environ. Health Vol. 11:316-322, Sept. 1965.
CFSTI, DDC: AD 628 566

A unique inhalation exposure facility has been built to study the effects of low atmospheric pressure and oxygen-rich atmospheres on the characteristics of truly uninterrupted, long-term, continuous exposure to toxic chemicals. The first experiments reported herein include exposure of a large number of mice, rats, dogs, and monkeys to graded doses of ozone, nitrogen tetroxide, and carbon tetrachloride in a 100% oxygen atmosphere at 5 psi pressure for 2 weeks duration. Further, a 90-day exposure to 5 psi 100% oxygen of a similar animal complement is also reported. Biochemical and enzymatic changes related to toxic exposure are discussed together with the future experiments planned for this facility.**

00472

J. Fry, J.E. Dillane, L. Fry

SMOG: 1962 V 1952. Lancet (Letters to the Editor) No. (7269):1326, Dec. 22, 1962.

Article compares the smog incidents of 1952 and 1962 in London insofar as chest disorders, morbidity and mortality are concerned. In general, article compares the severity of the two smog episodes.**

00473

F.G. Hueter, G.L. Contner, K.A. Busch, R.G. Hinners

BIOLOGICAL EFFECTS OF ATMOSPHERES CONTAMINATED BY AUTO EXHAUST. Arch. Environ. Health 12, 553-60, May 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

This report represents a status summary of the biological results obtained from the chronic exposures of experimental animals to various concentrations of irradiated and nonirradiated auto exhaust for periods of 6 weeks to 23 months. The chronic exposure of experimental animals to various concentrations of irradiated and nonirradiated auto exhaust-air mixtures resulted in significant biological effects indicating the following: irradiated auto exhaust (1) increases the susceptibility to pulmonary infection and chronic disease during the latter half of the animal's lifetime, and (2) markedly decreases mouse fertility and decreases the survival rate of infant mice; both raw and irradiated auto exhaust cause a stress and adaptation response in mice as measured via spontaneous activity, increase bone lead concentrations, and increase the amount of nonfunctional or abnormal lung tissue. No experimental atmospheric effects were observed concerning: mortality; histopathology; growth-bodyweight; immunology; hematology restricted to erythrocyte count, erythrocyte cell size distribution, hematocrit or hemoglobin concentration; blood O2 and CO2 values; oxygen consumption; or pulmonary function in relation to permanent impairment. Further studies are indicated to elucidate more fully the affected biologic parameters.##

00480

D. V. Bates

AIR POLLUTION AND CHRONIC BRONCHITIS. Arch. Environ. Health 14(1):220-4, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

Author deals with air pollution as it generally relates to pulmonary functions and discusses the effects of smoking and chronic bronchitis. These effects are equated to geographic areas. Study includes eight charts summarizing the results in Toronto, Winnipeg, Montreal and Halifax.##

00499

M. Corn and G. G. Burton

THE CONCENTRATION AND DISTRIBUTION OF IRRITANTS IN POLLUTED ATMOSPHERES. Preprint. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

Consideration of maximum recorded U.S. concentrations of single gaseous or particulate pollutants indicated that alterations in airway resistance and lung compliance in animals or man have not been demonstrated after inhalation of single irritants at these concentrations. At this time it is difficult to speculate on the acute or chronic changes produced, if any, in these functional measurements by inhalation of complex mixtures of low concentrations of individual irritants. Certainly, eye irritation demonstrates that effects which are not predictable on the basis of the action of a single irritant are produced by mixtures of irritants. Airborne particulate irritants should be assessed with respect to aerodynamic particle size, because (1) chemical composition of particles has been demonstrated to vary with size and (2) only certain particle sizes present in polluted atmospheres are capable of reaching receptors after inhalation by man. Among the defects of present routine sampling methodologies are: (1) size distribution of sampled particles is not known; (2) the optimum density of sampling stations for the procurement of reliable results is unknown, and (3) the irritant potential of pollutant mixtures is not taken into account when single pollutants are evaluated. (Author summary)**

00501

E. J. Fairchild, II

TOLERANCE MECHANISMS AS BIOLOGIC DETERMINANTS OF LUNG RESPONSES TO INJURICUS AGENTS. Arch. Environ. Health, 14(1):111-126, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

This presentation has attempted to focus on the conditions and characteristics of tolerance developmentas a biologic factor relative to the response of the lung to injurious agents. Besides insight to the possible mechanism accounting for tolerance, attempt was made to point out practical implications of the tolerane phenomenon. Thus, the protective mechanism of tolerance is primarily directed atainst the acute and subacute effects of deep-lung irritants. The realization of the degree of tolerance and cross-tolerance which develops in animals, duringintermittent exposures of varied concentrations, brings up the fate of lung tissue, as well as the whole organism, which is protected against the edema producing properties of irritants. Besides edemagenesis, irritants provoke another lung reaction, i.e., proliferation of cellular elements in the deeper reccesses, which in some instances may prove fatal. The alterations induced by more subtle, chronic exposure which should be of concern since tolerance does not appear to inhibit these; if anything, the tolerance mechanism may permit provocation of conditions such as emphysema, fibrosis, and may permit provocation of conditions such as emphysema, fibrosis, and other aging phenomena. Studies have shown that chronic exposures of 0.1-0.2 ppm of produced myocardial tissue damage in rabbits and mice, as well as significant increase of first and second generation neonatal mortality. In animals, at least, repeat exposures to low concentrations of deep-lung irritant such as are not innocuous even though tolerance mechanisms are operative. (Author's summary)**

00508

P.E. Morrow

ADAPTATIONS OF THE RESPIRATORY TRACT TO AIR POLLUTANTS.
Arch. Environ. Health 14(1):127-136, Jan. 1967.
(Presented at the American Medical Association Air Pollution
Medical Research Conference, Los Angeles, Calif.,
Mar. 2-4, 1966.)

This paper briefly describes the criteria for establishing certain biological responses as adaptations. The adaptations of the respiratory tract to air pollutants discussed in this paper are: increased endocytosis to the adaptagents, insoluble dusts; increased mucous secretion to the adaptagents, respiratory irritants; and the development of tolerance to the actue edema produced by the adaptagents, oxidants. Some other adaptates of less significance are also discussed. For each of the principal adaptations, an attempt was made to provide some mechanistic basis. An increase in long term research on low dose effects and an epidemiologic approach to the procurement and assessment of normal physiological parameters are needed. (Author's Abstract)##

00509

O. N. Myrvik D.G. Evans

METABOLIC AND IMMUNOLOGIC ACTIVITIES OF ALVEOLAR MACROPHAGES.
Arch. Environ. Health 14(1):92-96, Jan. 1967. (Presented
at the American Medical Association Air Pollution Medical
Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

Normal alveolar macrophages develop a marked increase in metabolic activity of the gluconic shunt pathway following phagocytosis of heat-killed BCG. A rise in lysozyme and acid phosphatase also was observed about 5 to 7 days after intratracheal injection of BCG. A similar lag in the occurrence of a bactericidal factor against Mycobacterium smegmatis was observed following intratracheal injection of living M. smegmatis. These observations suggest that alveolar macrophages respond adaptively to their phagocytic load and that metabolic stimulation may be a prerequisite to immunologic expression. Nitrogen dioxide was found to suppress metabolism of alveolar macrophages as well as their phagocytic function. It is proposed that certain pollutnats could impair the immunologic capacity of the respiratory tract leading to chronic low grade pulmonary infections. Allergic responses, as well as primary tissue damage caused by proliferating microorganisms, may contribute to the pathogensis of air pollution disease. (Author abstract)##

00511

R. E. Pattle P. Down

LUNG SURFACTANT AND ITS POSSIBLE REACTION TO AIR POLLUTION. Arch. Environ. Health 14(1):70-76, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

An outline is given of the knowledge of the alveolar surfactant, its function and the possible reaction of the surfactant with atmospheric pollution, of which there is no experimental evidence available. The difficulty of obtaining such evidence, with special reference to an imaginary investigation of the effect of nitrogen dioxide on the surfactant, is discussed in this paper.##

00515

E.D. Robin

CLINICAL IMPLICATIONS OF BASIC RESEARCH IN AIR POLLUTION. Preprint. (Presented at the American Medical Association Air pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

The interest of the clinical physician in the relationship of lung to air pollution disease involves several questions: (1) To what extent are specific identifiable substances in polluted air capable of producing specific identifiable abnormalities of lung structure and/or function? (2) To what extent is polluted air involved in the pathogenesis of chronic nonspecific obstructive pulmonary disease?, and (3) What are the therapeutic and prophylactic implications of the relationship between air pollution and lung disease? The answer to the first question is reasonably clear. There are a number of specific situations in which there appears to be a direct cause and effect relationship between the presence of specific substances in the ambient environment and the precipitation of overt pulmonary manifestations. The category includes the well-known ability of high concentrations of oxides of N to provoke intense lung damage in silo workers. Likewise, the mass deaths observed in the Meuse Valley in Belgium and in Donora, Pa., co-existent with high concentrations of pollutants in the air fit this pattern. The role of chronic air pollution in chronic lung disease, is a much more complicated situation. In this case, one deals with a heterogeneous group of agents acting on a heterogenous set of subjects. One consequence of this complicated relationship is that research approaches whichhare essentially descriptive are unlikely to provide data of basic etiological importance and the major breakthroughs in this field have not yet occurred and may never occur with the use of standard methodology. Thought should be given to the development of more basic approaches, such as laboratory models for the study of long

term impact of air pollution on the biology of the lung and of focusing the tools of the modern molecular biochemists and molecular geneticists on the problem of lung disease. As to therapeutic and prophylactic implications of air pollution and its control, the answer to this question is relatively simple. Any lack of basic understanding need not paralyze a vigorous approach to air pollution control.

00521

S. W. Tromp

BIOMETEOROLOGICAL ASPECTS OF RESPIRATORY DISEASES. Preprint. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

The influence of short (weather) and long periodical (climate) effects of the atmosphere surrounding man in relation to respiratory diseases are discussed. Examples of biometeorological application are given, demonstrating studies of the influence of weather and climate both on healthy and sick population. These studies may give clues to deeper physiological mechanisms involved and to the methods to cure certain diseases without use of drugs.##

00570

W. P. D. Logan

MORTALITY FROM FOG IN LONDON, JANUARY, 1956. Brit. Med. J. (London), No. 4969:722-725, March 31, 1956.

Dense fog during January 4 to 6, 1956, caused almost 1,000 additional deaths in Greater London. The distribution of these deaths by age, cause, and geographical area is described. This is the third major fog mortality incident in London since 1948. (Author's abstract)##

00609

A. P. Krueger, S. Kotaka, P. C. Andriese

STUDIES ON THE BIOLOGICAL EFFECTS OF GASEOUS IONS - A REVIEW. Biometeorological Research Centre, Leiden, Holland (Special Monograph Series, Vol. 1). Mar. 8, 1966. 14 pp.
CFSTI, DDC: AD 637 230

This report summarizes and evaluates experimental findings of the past ten years on the physiolcgical and pathological changes produced in a variety of living forms as a result of exposure to gaseous ions. The aspects of gaseous ion research which are included in the fields of physics, meteorology, medicine and environmental engineering are recognized to be intimately linked with the biological aspects. Some of the conclusions

cited: 1. Comparable concentrations of positive air ions accelerate the growth of higher plants but cause a moderate increase in the death rate of bacteria and fungi. 2. Carbon dioxide ions have an inimical effect on certain functions of the respiratory tree in the mouse while oxygen ions reverse these changes.##

00617

S. D. Murphy R. A. Prindle

EFFECTS OF AUTOMOTIVE EXHAUST ON PULMONARY FUNCTION. Preprint. (Presented at Symposium on Air Pollution and Pulmonary Disease, American Medical Association, Los Angeles, Calif., Nov. 25, 1962.)

This investigation has demonstrated that at least two qualitatively different types of functional pulmonary responses are elicited in guinea pigs exposed to experimental atmospheres of irradiated auto exhaust. One type is characterized by rapidly reversible increases in pulmonary flow resistance and decreased respiratory rates, and resembles the response produced by irritating aldehydes. A second response is characterized by increased respiratory rates, is more slowly reversible, and resembles effects produced by oxidant-type irritants. Continuous exposure of guinea pigs to auto exhaust for several weeks did not appreciably alter baseline values for pulmonary function when the animals were tested while breathing clean air; however, guinea pigs exposed to irradiated exhaust were less responsive to respiratory stimulation by carbon dioxide. The possible interaction of pulmonary infection and chemical effects of exhaust in the mediation of this latter effect requires further study. (Author summary)##

00622

A.P. Altshuller, D. Klosterman, P.W. Leach, and J. E. Sigsby, Jr.

THE IRRADIATION OF SINGLE AND MULTI-COMPONENT HYDROCARBON - AND ALDEHYDE - NITRIC OXIDE MIXTURES IN AIR UNDER DYNAMIC AND STATIC FLOW CONDITIONS. Preprint. 1964.

An investigation has been made of the chemical, aerosol plant damage, and eye irritation effects of irradiating various single hydrocarbon - aldehyde or multi-component hydrocarbon - NO systems under dynamic flow conditions. The systems investigated included the following individual hydrocarbons which were irradiated in the presence of NO (and traces of NO2): ethylene, 1-butene, 1,3-butadiene, toluene, xylene, and 1,3,5-trimethylbenzene, n-hexane, 3-methylpentane, 2,4,4-trimethylpentane, and cyclchexane. Mixtures of hydrocarbons including ethylene and 1-butene; ethylene, 1-butene, and trans-2-butene; and ethylene, 1-butene, trans-2-butene, and mixed xylenes also were irradiated in the presence of nitrogen oxide in air. In addition the photooxidation of the formaldehyde - oxygen,

propinaldehyde - oxygen, formaldehyde - NO and propionaldehyde - NO systems were investigated. In these dynamic irradiation experiments the 4 paraffinic hydrocarbon - NO systems produced neither oxidant nor plant damage. In all of these systems NO was only partially converted during irradiation and NO2 did not peak. When 0.5 ppm of ethylene, 0.5 ppm of an ethylene - butene-1 mixture, or 0.5 ppm of xylene was irradiated with 1 ppm of NO no net oxidant and no plant damage occurred. At ethylene or toluene concentrations between 3 and 6 ppm with 1 ppm of NO, irradiation produced oxidant but no plant damage of either the ozone or PAN type. Many of these mixtures did react somewhat with the disappearance of part of the hydrocarbon and the formation of significant yields of formaldehyde or aliphatic aldehydes. Propionaldehyde when irradiated in the presence of small traces of nitrogen oxides produced severge plant damage. (Author abstract)##

00632

C. Xintaras, C. E. Ulrich, M. F. Sobecki, and R. E. Terrill

BRAIN POTENTIALS STUDIED BY COMPUTER ANALYSIS. Arch. Environ. Health 13, 223-32, Aug. 1966.

Response morphology, Computers, Data analysis
Brain responses to flashes of light in a freely moving rat have been examined with on-line summation techniques. The present study uses this method to obtain information on response morphology as it varies from alertness to drowsiness to spontaneous or induced sleep. Its purpose was to determine the biologic significance of initial changes in evoked response in rats exposed to carbon monoxide and ozone previously reported by the authors. Photic stimuli were presented to male rats implanted with cortical recording electrodes. Cortical potentials evoked in response to each light flash were averaged by computer. Changes induced by carbon monoxide and pentobarbital were compared with normal changes from wakefulness to spontaneous sleep. The findings suggest that alterations in the evoked response during light spontaneous or induced sleep may be associated with a lowering of vigilance level and may be related to the integrative functions necessary to awareness and for processing sensory signals into meaningful perception.##

CC637

S. D. Murphy, C. E. Ulrich, S. H. Frankowitz, and C. Xintaras

ALTERED FUNCTION IN ANIMALS INHALING LOW CONCNETRATIONS OF OZONE AND NITROGEN DIOXIDE. Am. Ind. Hyg. Assoc. J. Vol. 25:246-253, June 1964.

Quantitative measurements of respiratory function of guinea pigs were made before, during, and after exposure to low concentrations

of ozone, and nitrogen dioxide. The earliest effects detected during exposure to either of the gases were increased respiratory frequency and decreased tidal volume. These effects were noted during 2-hour exposures to concentrations of ozone as low as 0.34 ppm or within 4 hours of exposure to NO2 at a concentration of 5.2 ppm. Previous exposure to ozone did not result in tolerance to the respiratory function changes produced during exposure to a 1.5-ppm concentration of the gas. Voluntary running activity of mice was depressed during exposure to concentrations of ozone between 0.2 and 0.7 ppm and to NO2 concentrations of 7.7 to 20.9 ppm. (Author abstract)##

00638

P. A. Kenline

OCTOBER 1963 NEW ORLEANS ASTHMA STUDY. Arch. Environ. Health Vol. 12:295-304, Mar. 1966.

This paper reports on aerometric activities carried out in New Orleans from Oct. 3 through Nov. 5, 1963. The objectives of these activities were to establish any difference in air quality between asthma outbreak days and other days, evaluate geographic and temporal variation in pollution characteristics, and evaluate various uncommon methods of measuring air pollution. (Author abstract)##

00639

M. B. Gardner

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. III. LUNG TUMORS IN MICE. Arch. Environ. Health Vol. 12:305-313, Mar. 1966.

This paper reports the long-term effect of inhaling Los Angeles ambient air upon the incidence of lung adenomas in several inbred strains of mice. Despite the absence of histopathologic evidence for any specific acute effect related to ambient air pollution in the experimental mice colonies, the statistical evidence of this study indicates a strong likelihood that ambient Los Angeles atmosphere does possess a definite though slight activity in promoting pulmonary adenomatous tumors in aging inbred mice. These findings offer further evidence that some lung tumorigenic activity does exist in the indigenous respiratory environment.##

00645

H. W. Phelps

FOLLOW-UP STUDIES IN TOKYO-YOKOHAMA RESPIRATORY DISEASE. Arch. Environ. Health Vol. 10(2):143-147, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Tokyo-Yokohama Respiratory Disease appears to be a bronchitic illness induced most often by the combined effects of cigarette smoking and the severe air pollution present in the Tokyo-Yokohama area. It is characterized by severe cough, wheezing, persistent shortness of breath, reduced one-second forced expiratory volume (FEV sub 1), hyperventilation, reduced oxygen saturation. Since the patient suffering from this disease usually shows at least some symptomatic relief when away from the Kanto Plain, the preferred method of treatment at this time is removal from the Tokyo-Yokohama Area.##

00649

I. E. Smith

PEROXYACETYL NITRATE INHALATION. Arch. Environ. Health Vol. 10(2):161-164, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

The acute toxicity of ozone has been demonstrated to be strikingly enhanced if animals, during exposure to non-injurious levels of ozone, are concurrently subjected to intermittent exercise. As the present experiment demonstrated a significant effect of the pollutant peroxyacetyl nitrate (PAN) upon the oxygen uptake only when the subjects were exposed to the additional stress of exercise, it is suggested that investigators who study the problem of the effect of atmospheric pollutants upon the respiratory efficiency of man include the phase of exercise in their experimental design.##

00650

M.C. Battigelli

EFFECTS OF DIESEL EXHAUST. Arch. Environ. Health Vol. 10(2)165-167, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Over the past three years the author's work at the School of Public Health in Pittsburgh has been directed to the possible detrimental effects brought about through exposure to diesel motor exhaust. Attention was directed to railroad workers employed in locomotive repair shops. Neither respiratory complaints nor impaired pulmonary function, could be related to this type of occupational exposure. As a second phase in this investigation, volunteers were exposed to diesel exhaust gas for short periods and pulmonary resistance was measured. The levels utilized for these controlled exposures are comparable to realistic values such as those found in railroad shops. No effect could be measured in these volunteers after they had been exposed at these varying levels of pollution from diesel exhaust for short periods up to one hour.##

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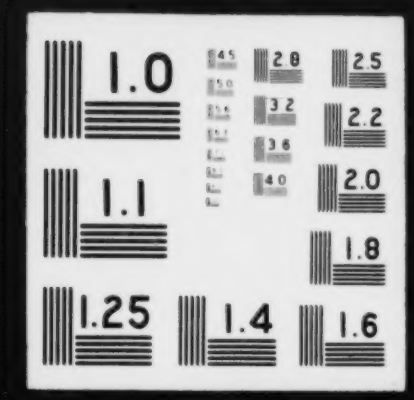

00656

J. E. Mudd

RESPONSES OF ENZYME SYSTEMS TO AIR POLLUTANTS. Arch. Environ. Health Vol. 10(2):201-206, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10 11, 1964.)

Peroxyacetyl nitrates and ozone can oxidize the reduced forms of nicotinamide adenine dinucleotides. The oxidation product obtained by reaction with peroxyacetyl nitrate is biologically active whereas the reaction product from the ozone oxidation is an enzyme inhibitor. Peroxyacetyl nitrates inactivate enzymes, but protection can be afforded by substrate and co-factor. The characteristics of protection are the same as those required for protection from sulfhydryl reagents. It has been concluded that enzyme inactivation is due to oxidation of the enzyme sulfhydryl group. Peroxyacetyl nitrate inhibits the incorporation of acetate into fatty acids more than it inhibits incorporation into water-soluble acids. This result is consistent with a physiological role for either the mechanism of oxidation of reduced dinucleotides or the mechanism of oxidation of enzyme sulfhydryl groups. (Author Summary)##

00658

F.L. Estes, C.H. Pan

RESPONSE OF ENZYME SYSTEMS TC PHOTOCHEMICAL REACTION PRODUCTS. Arch. Environ. Health Vol. 10(2):207-212, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Exposure to photochemical reaction products inhibited the activity of glutamic dehydrogenase from Escherichia coli. With a glutamate substrate the inhibition increased at a rate comparable to the inhibition of the growth of the cells. Considerably less inhibition was observed for the reaction in the reverse direction. With increasing formaldehyde concentrations, the reaction of glutamic dehydrogenase from mammalian source was more rapidly inhibited in the reverse than in the forward direction. From the data to date, it appears that only at very low concentrations could formaldehyde produce the relationship of the reactions observed with the photochemical reaction products. There is no evidence, however, that such concentration would produce comparable magnitudes of inhibition with time. (Author summary)##

Tokyo-Yokohama Respiratory Disease appears to be a bronchitic illness induced most often by the combined effects of cigarette smoking and the severe air pollution present in the Tokyo-Yokohama area. It is characterized by severe cough, wheezing, persistent shortness of breath, reduced one-second forced expiratory volume (FEV sub 1), hyperventilation, reduced oxygen saturation. Since the patient suffering from this disease usually shows at least some symptomatic relief when away from the Kanto Plain, the preferred method of treatment at this time is removal from the Tokyo-Yokohama Area.##

00649

L. E. Smith

PEROXYACETYL NITRATE INHALATION. Arch. Environ. Health Vol. 10(2):161-164, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

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00650

M.C. Battigelli

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00659

G.C. Buell, Y. Tokiwa, P.K. Mueller

POTENTIAL CROSSLINKING AGENTS IN LUNG TISSUE. Arch. Environ. Health Vol. 10(2):213-219, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

An investigation of analogous molecular changes in vivo after exposure to ozone was undertaken in the hope that a better understanding of ozone toxicity would emerge. The interaction of lung tissue and ozone in vivo results in the formation of carbonyl compounds, which are most likely derived from lung proteins. Structural changes in lung tissue must have occurred. The aldehydes formed may effect an intra- or intermolecular crosslinking of protein molecules, further altering normal lung structure. Exposure to ozone apparently affects the ground substance. The data suggest an oxidative degradation of hyaluronic acid. The findings reported here give evidence for explaining on a molecular basis pulmonary events caused by polluted air.##

00660

R.D. Buckley O.J. Balchum

ACUTE AND CHRONIC EXPOSURES TO NITROGEN DIOXIDE. Arch. Environ. Health Vol. 10(2):220-223, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

This study was an attempt to measure some of the metabolic effects of the air pollutant NO2 on lung and other body tissues. To relate changes in oxygen consumption and enzyme activities in organs to length of exposure it would be well to subject a series of animals to a single concentration of NO2 (15 ppm, for example) and study tissues from animals (exposed and control) during regular intervals after the initiation of the regimen. This would clarify the observations in oxygen consumption of liver homogenate. It would also be of value to express enzyme activity in terms of substrate utilization in order to obtain more information about the specific activity of the tissue homogenates.##

00665

D.E. Rounds F.F. Bils

EFFECTS OF AIR POLLUTANTS ON CELLS IN CULTURE. Arch. Environ. Health Vol. 10(2):251-259, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

From an analysis of oxygen consumption rates, all cell types tested in vitro showed a partial but reversible inhibition in oxidative activity during treatment with $NaNO_2$. Morphological studies of living cells with phase contrast microscopy and of fixed material with the electron microscope revealed that the alveolar wall cell showed changes in the shape of the nucleus and the ultrastructure of the mitochondria during NO_2 treatment. These changes may offer the opportunity to describe and quantitate the biological effects of NO_2 and possibly, of other air pollutants. (Author summary)##

00668

O.J. Balchum, P.D. Buckley, P. Sherwin, M. Gardner

NITROGEN DIOXIDE INHALATION AND LUNG ANTIBODIES. Arch. Environ. Health Vol. 10(2):274-277, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

A circulating substance or lung tissue antibody has been found to appear in the serum of guinea pigs inhaling nitrogen dioxide in concentrations of 5 ppm and of 15 ppm. It can be detected in dilutions of serum greater than 1:100,000 by its property of agglutinating latex particles coated with normal lung proteins.##

00672

W.Y. Hallett

EFFECT OF OZONE AND CIGARETTE SMOKE ON LUNG FUNCTION. Arch. Environ. Health Vol. 10(2):295-302, Feb. 1965. (presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Ozone exposure levels between 1 and 3 ppm for up to half an hour produced changes that were more definite than those produced by smoking one cigarette, and in a greater proportion of subjects. The bronchoconstriction produced as measured by the ventilatory capacities was of a magnitude similar to changes produced in diffusion capacity and minute ventilation. The ozone levels were from two to six times as high as the highest "alert" levels experienced during the year in Los Angeles. The exposure of these subjects was very brief and their awareness of similarity to effects of smog is worthy of retention.##

00681

J. R. McCarroll, F. J. Cassell, W. Ingram, and D. Wolter

HEALTH AND THE URBAN ENVIRONMENT (AIR POLLUTION AND FAMILY ILLNESS: I. DESIGN FOR STUDY). Arch. Environ. Health Vol. 10(2):357-363, Feb. 1965. (Presented at the Seventh

Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Absorption of harmful air pollutants has exacerbated preexisting pulmonary disease during "acute" air pollution episodes both in the urban United States and in various European cities. Evidence for the initiation of permanent disease in previously well persons is fragmentary. To study this relationship a careful longitudinal study of a significant group of normal city dwellers together with simultaneous monitoring of the environment to which they are exposed has been undertaken. Our goal is to follow daily variations in health of a group of urban families of diverse backgrounds living in the same geographic area and to correlate these over a period of time with variations in the atmosphere to which they are exposed.##

00738

M.B. Purvis, S. Miller, R. Ehrlich

EFFECT OF ATMOSPHERIC POLLUTANTS ON SUSCEPTIBILITY TO RESPIRATORY INFECTION 1. EFFECT OF OZONE. J. Infect. Diseases 109, 238-42, 1961.

A 3-hour exposure to 4 parts per million of ozone significantly decreased the resistance of mice to respiratory infection initiated by challenge with an aerosol of Klebsiella pneumoniae administered less than 19 hours after exposure to ozone. The same phenomenon was observed in infected animals exposed to ozone up to 27 hours after challenge with the infectious aerosol. The decrease in resistance was demonstrated by an increase in mortality rate and shortening of survival time. (Authors" abstract)##

00742

D.I. Hammer, B. Portnoy, F.M. Massey, W.S. Wayne, T. Oelsner, P.F. Wehrle

LOS ANGELES AIR POLLUTION AND RESPIRATORY SYMPTOMS - RELATIONSHIP DURING A SELECTED 28-DAY PERIOD. Arch. Environ. Health Vol. 100 474-480, Mar. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964).

Two populations of student nurses, one in Los Angeles and one in Santa Barbara, reported selected respiratory symptoms by means of daily symptom diaries. The prevalence of these symptoms and their relationship to a single air pollutant during a 28-day period is described. These data are part of a 32-month study ending in June, 1964. A time-associated relationship between daily oxidant levels and the mean daily frequency of eye discomfort in the Los Angeles group was observed during the study period. This relationship was not observed for any of the other symptoms. The mean 28-day frequencies of all symptoms

reported by the Los Angeles student nurses were equal to, or greater than, those reported by the Santa Barbara student nurses. (Authors' abstract)##

00779

H.F. Swann, Jr., D. Brunol, L.G. Wayne, C.J. Balchum

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. II. CHRONIC EXPOSURE OF GUINEA PIGS. Arch. bEnvirn. Health. Vol. 11:765-769, Dec. 1965.

Guinea pigs have been directly exposed to ambient Los Angeles air for two years. Monthly measurements of their total expiratory resistance were made plethysmographically, and compared with those of guinea pigs breathing air filtered through activated-charcoal. Variations in resistance occurred from month to month, but no difference in resistance was noted between guinea pigs residing in ambient air and those living in filtered air. Total pulmonary resistance appeared to increase with aging. During the second year of their life span, the mortality of guinea pigs living in ambient air was slightly greater than of those living in filtered air, but this difference was not significent at the 5% level by the chi square test. (Author summary)##

00794

W.A. Young, B.B. Shaw, D.V. Bates

EFFECT OF LOW CONCENTRATIONS OF OZONE ON PULMONARY FUNCTION IN MAN. J. Appl. Physiol., 19(4):765-768, July 1965.

Eleven subjects in sixteen experiments breathed 0.6-0.8 ppm of ozone through a mouthpiece for 2-hr periods. Measurements of pulmonary function were compared with those observed after a control experiment in which air was breathed through the same circuit for a similar period. In this concentration, ozone was found to produce a highly significant reduction in steady-state DL sub CO of 5.4 ml CO/min mm Hg, a change about four times larger than that of the air control experiments. The vital capacity, FEV0.75 X 40, and maximal midexpiratory flow rate decreased by about 10% after ozone breathing, the change being statistically significant in the first two of these only. Gas distribution, and dynamic and static pulmonary compliance were measured in two subjects and were not affected by ozone. Thickening of the alveolar wall by edema fluid is suggested as the most likely explanation of the fall in DL sub CO that has been observed. The vital capacity and expiratory flow rates may be limited in part by tracheobronchial irritation that follows inhalation of 0.6 ppm of ozone for 2 hr. (Author abstract)##

00825

AIR POLLUTION AND HEALTH. Bull. N.Y. Acad. Med. 42, (7) 588-619, July 1966.

Acute episodes of mortality and morbidity furnish strong support for a casual relationship between air pollution and injuricus effects. The following conclusions were established: (1) Air pollution in episodes cf high levels is harsful and can be lethal. (2) Although chronic effects have not yet been demonstrated, it si reasonable to presume that since episodes brought acute sickness and death, exposure to lesser concentrations for prolonged periods will have effects. (3) Not all the injurious pollutants have been identified, nor have their adverse effects been definitely and specifically established. Recommendations are made based cn the conclusions. (Author's summary) ##

00836

P. Gross, L.D. Scheel, H.E. Stokinger

OZONE TOXICITY STUDIES: DESTRUCTION OF ALVEOLAR SEPTA--A PRECURSOR OF EMPHYSEMA. Preprint. (Presented at the Seventh Aspen Conference, Colo., June 10-13, 1964.)

Chronic exposure of hamsters and rabbits to lcw concentrations cf ozone results not only in an obvious chronic pneumonitis, but also in a less obvious destructive process, the latter resulting in contraction of alveolar septa. These contracted alveolar septa may be seen as rounded, cushicn-like cellular agtregations of overlapping cells; or short, thick mushroom-shaped structures containing a peripheral button-like mass of condensed reticulin; as well as a uniformly thick cellular structure with attenuated axial reticulin. Occasicnally the septum, though greatly shortened, may have a normal thickness and cellularity but the axial reticulin is attenuated and has a terminal button-likethickening. These septal abnormalities are not associated with enlargement of air spaces. Although contracture of alveolar septa is suggestive of early departitioning of lung tissue, this is not a certainty. It seems logial, however, that findings such as these are proper intermediate steps to the disappearance of alveolar walls and hence, to emphysema. Further study using more prolonged exposures to low concentrations of ozone followed by long-term survival, may provide more definitive conclusions. (Author summary) ##

00852

H.E. Stokinger

OZONE TOXICOLOGY - A REVIEW OF RESEARCH AND INDUSTRIAL EXPERIENCE, 1954-1964. Arch. Environ. Health 10, 819-31, May 1965.

The rise of ozone as an important air pollutant and component cf oxidant smog serves as the cause for this review of research and industrial experience in czcne tcxicology for the period 1954-1964. After a brief introduction, the author discusses the material under the follcwing subject headings: Effects on Man; Extra-pulmonary Effects on Man; Effects in

Animals - Acute Toxocity; Factors Affecting Toxicity; Tolerance Development; Cross-Tolerance; Chronic Toxicity; Pffects in Lower Organisms and Cell Structures; Interactions; and Mechanisms.##

00854

G.C. Buell P.K. Mueller

TOXICITY OF OZONE (A SUPPLEMENTAI REVIEW). California Dept. of Public Health, Berkeley, Divisicn of Labs. (AIHL Rept. No. 18). Sept. 1965. 24 pp.

This review was prepared as an aid in the possible writing of a technical report concerning air quality standards for ozone. It supplements a sirilar report by stokinger and presents familiar and perhaps unfamiliar data in different perspective on the effects of ozone in various concentrations on man, animals, and microorganisms, and discusses perspectives concerning modes of action.##

00919

G. Freeman and G. B. Haydon

EMPHYSEMA AFTER LOW-LEVEL EXPOSURE TC NC2. Arch. Environ. Health, Vol. 8:125-8, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference San Francisco, Calif., Jan. 28-29, 1963.)

Biological sequelae of long-term exposures to lcw concentrations of nitrcgen dioxide have become of interest because oxides of nitrogen are a regular ccnstituent of smog. Current studies have determined the maximum nitrogen dioxide concentration in air that does not cause death frcm acute pulmonary edema and allows rats to survive for several months. At this and at lower concentrationa, long-term effects are being studied initially, with particular attention to the pulmonary pathology.##

CC932

T. E. Huber, S. W. Joseph, E. Knoblock, P. L. Redfearn, and J. A. Karakawa

NEW ENVIRONMENTAL RESPIRATORY DISEASE (YOKCHAMA ASTHMA) (PRELIMINARY REPORT). Arch. Ind. Hyg. Occupational Med., Vol. 10:399-408, 1954. (Presented before the National Academy of Sciences-National Pesearch Council, Division of Medical Sciences, Subcommittee on Atmcspheric & Industrial Hygiene, 1954, and the Committee on Sanitary Engineering and Environment, 1954.)

The clinical features are presented of a new environmental respiratory disease occurring in certain areas of Japan during the winter months among the United States military personnel. From

preliminary atmospheric data there appears to be a correlation between the incidence of this environmental respiratory disease entity, the concentration of air contaminants, and smog formations. Of the air contaminants investigated, only the ether-soluble aerosols and dust appear to have significant correlation with the incidence of this respiratory entity. Additional investigations will be required to corroborate the above suggested correlations. (Author summary)##

00933

M. B. Purvis and R. Ehrlich

EFFECT OF ATMOSPHERIC POLLUTANTS ON SUSCEPTIBILITY TO RESPIRATORY INFECTION. II. EFFECT OF NITROGEN DIOXIDE. J. Infect. Diseases, Vol. 113:72-76, Aug. 1963.

A 2-hour exposure of mice to as little as 3.5 ppm of nitrogen dioxide significantly increased their susceptibility to respiratory infection initiated by challenge with an aerosol of Klebsiella pneumoniae. This effect was observed up to 27 hours after exposure. Infected animals exposed to 25 ppm of nitrogen dioxide for 2 hours showed an increased mortality rate and decreased survival time. This effect was evident up to 72 hours after infection. Exposure to 2.5 ppm of nitrogen dioxide for 2 hours did not induce any changes in susceptibility to infection. (Author summary)##

CC980

L.S. Jaffe

THE BIOLOGICAL EFFECTS OF PHOTOCHEMICAL AIR POLLUTANTS ON MAN AND ANIMALS. Am. J. Pub. Health, 57(8):1269-1277, Aug. 1967. (Presented at the Annual Meeting, American Public Health Association, San Francisco, Calif., Oct. 31 - Nov. 4, 1966.)

Common manifestations of atmospheric photochemical smog are eye irritation, respiratory distress, haze formation (reduction in visibility), peculiar odors, characteristic vegetation damage, and excessive cracking of rubber products as well as the presence of unusually high levels of oxidizing substances identified as photochemical oxidants. The photochemical oxidants are a major class of compounds found in photochemical smog. They consist of a complex mixture of atmospheric oxidizing substances whichvary in time and place and which are not completely defined chemically. They can be measured routinely in community atmospheres, however, and analyzed collectively for "total oxidant", the net oxidizing effect of all such substances in the atmosphere, thus serving as useful indices of effective levels of photochemical pollution. Ozone and perocyacyl nitrates (PAN compounds) have been identified as important oxidants found in photochemical smog. A review of the important adverse effects of atmospheric photochemical smog on man and animals expressed in terms of atmospheric "total oxidant" concentrations is presented

based on published reports and some yet unpublished reports and research findings. Additionally, data based on laboratory exposures of man and animals to ozone and PAN compounds are reviewed. An understanding of the effects of these individual oxidants in pure form contributes substantially to our knowledge of the effects of the ambient photochemical "total oxidant" mixture. The photochemical oxidants, particularly ozone, are severe respiratory irritants which cause temporarily impaired lung function in man and animals in short exposures. In prolonged exposures, there is an increase in mortality of newborn animals as well as of animals exposed to respiratory infection. Recent studies indicate a decreased birthrate of laboratory animals in photochemical exposures to synthetic photochemical smog. Additionally, late studies have shown that an increase in lung tumor formation occurred in aging mice exposed to atmospheric photochemical smog over a 16-month study period when compared to controls exposed to filtered air. (Author abstract)##

00983

H.W. Phelps

AIR POLLUTION ASTHMATIC-BRONCHITIS AMONG UNITED STATES PERSONNEL IN JAPAN. Japan Heart J., 2(2):180-186, April 1961. (Presented as a part of a symposium on "Yokohama Asthma," June 24, 1960.)

Asthmatic bronchitis, presumably due to air pollution, has been a major case of sickness among U.S. forces personnel in the Tokyo-Yokohama area since 1946. The most prominent symptoms are nocturnal cough, wheezing, and shortness of breath in an individual who has a negative history of asthma prior to coming to Japan. The attacks of coughing and wheezing occur most frequently at night and during periods of increased smog concentration. Perhaps most characteristic of this disease is the marked subsidence of symptoms when the patient leaves the Kanto Plain. Our treatment has been outlined with special emphasis on bronchodilators, hydration, and liquefaction of bronchial secretions. Adrenal steroids are used in the seriously ill patient and have been very useful in relieving symptoms. Patients with marked shortness of breath, with airflow obstruction by pulmonary function studies and with frequent occurence of coughing and wheezing are usually sent back to the United States. Follow-up studies show that almost all of these patients dramatically improved as soon as they are sent back to the United States. (Author abstract)##

00989

J.W.A. Grant

HUMAN CARDIOVASCUL DISEASE AND ATMOSPHERIC AIR POLLUTION IN LOS ANGELES, CALIFORNIA. Intern. J. Air Water Pollution (London) 9(4):219-231, April 1965.

A multiple regression technique is used. This allows atmospheric (Predictor) variables to predict a hospital (Predicted) variable, and incorporates a concurrence-latency hypothesis which allows the dependent variable this week to be related to independent variables this week, last week, 2 weeks earlier, and 4 weeks earlier. Hence, for this study hospital admissions of Los Angelenos of all ages for diagnosed cardiovascular dysfunction (the Y) is related to and predicted by multiples of (the X"s): oxidant, relative humidity, temperature. Significant findings are: (1) Sustained high oxidant: low relative humidity: low temperature conditions are related, on a post-exposure basis of 4 weeks, to increased cardiovascular disease. These atmospheric conditions presented a formidable and potentially catastrophic danger to public health in Los Angeles, California. Significantly, partial correlation coefficients ranged from plus or minus 0.9891. (2) The system of atmospheric variables explains to a significant degree variation in the cardiovascular incidence, that is cardiovascular admissions into the hospital. Significantly the multiple regression coefficient is R equals 0.9922, the coefficient of determination, R to the 2nd power equals 0.9845. (3) The system of variables has a linear effect as proved by the F-criterion, also the residuals between actual and predicted values of the dependent variable are nonsignificant as proved by the alpha-criterion, meaning that the prediction equation (multiple regression system) is valid. (4) Post-exposure to atmosphere, in this instance 4th-week post-exposure, is a significant consideration when evaluating the effects of atmosphere upon human health. (Author abstract)##

C0992

W.J. Jacumin, D.R. Johnston, L.A. Ripperton

EXPOSURE OF MICROORGANISMS TO LOW CONCENTRATIONS OF VARIOUS POLLUTANTS. Ind. Hyg. J., 25(6):595-600, Dec. 1964.

A technique for exposing microorganisms to air-borne toxicants was developed. Serratia marcescens were exposed to irradiated atmosphere of clean air, No2 at 0.5 ppm, hexene-1 at 2 ppm, and No2 plus hexene-1. Only those containing No2 differed significantly from clean air, suggesting that hexene-1 played no major role. The technique has inherent difficulties, limiting its application pending further development. (Author abstract)##

C0994

S.D. Murphy, H.V. Davis, V.L. Zaratzian

BIOCHEMICAL EFFECTS IN RATS FROM IRRITATING AIR CONTAMINANTS. Toxicol. Appl. Pharmacol., 6(5):520-528, Sept. 1964.

The effect of inhalation of acrolein vapors on the activity of several enzymes of male rat tissues was investigated. Elevated hepatic alkaline phosphatase activity occurred following

continuous 40-hour exposure to acrolein at concentrations as lcw as 2.1 ppm. Exposure to higher concentrations for shorter periods of time also increased liver AP activity, but the effect was not constant with a constant Ct. Inhalation of ozone, nitrogen dioxide, formaldehyde, and sulfur dioxide also increased liver AP activity. It appears that the hepatic AP response is a nonspecific effect and may be a symptom of the alarm-reaction to stress. (Author summary) ##

CC995

R.E. Pattle

SURFACE LINING OF LUNG ALVEOLI. Physiol. Rev. 45(1):48-79, Jan. 1965.

The alveoli of the mammalian lung are lined with a film of lipoprotein, about 50 A thick. This film has the function of lowering the surface tension, especially if the surface area is reduced, and so enabling the alveoli to remain open. This film is underlain by a layer of a lipoprotein of high molecular weight, the "lining complex," from which the film is formed. The thickness of this layer is unknown, but it is too thin to detect histologically. In the respiratory distress syndrome of the newborn, formation of the lining film is defective and collapse of the lung ensues. This paper reviews the knowledge of the alveolar lining. The effect of surface tension of the mechanics of the lung is covered less fully than other aspects of the subject, as it has recently been reviewed by Mead. The present review is divided into two main parts. One (section II) deals with those matters that, in the reviewer's opinion, are well established; the other (section III) discusses various points on which the evidence is less certain. Only in section III are progress reports, private communications, or unpublished items of the reviewer's own experience quoted and then only if they are of particular interest.##

01019

J. W. A. Brant and S. R. G. Hill

HUMAN RESPIRATORY DISEASES AND ATMOSPHERIC AIR POLLUTION IN LOS ANGELES, CALIFORNIA. Intern. J. Air Water Pollution Vol 8:259-277, 1964.

By an analysis of hospital data from Los Angeles County General Hospital and atmospheric data from the downtown Los Angeles air pollution monitoring station, the authors conclude that there is a cause-effect relationship between atmospheric pollution and health. Intensive laboratory investigations to clarify this physiologically are recommended.##

01024

G. Dean

LUNG CANCER AMONG WHITE SOUTH AFRICANS. British Med. J., 852-7, Oct. 31, 1959.

Analysis of the 1947-56 male lung cancer deaths in South Africa by age, country of birth, and place of residence has shown that among those dying aged 45 to 64 (but not among those dying aged 65 and over) British immigrants have had much higher lung cancer mortality rates than Union-born men or immigrants from other countries. Further, among all three categories in South Africa--Union-born men, British male immigrants, and male immigrants from other countries--the lung cancer mortality rates have increased approximately with the level of urbanization and industrialization. Neigher the differences between the lung cancer mortality rates of these three groups nor the urban/rural gradient can be attributed to differences in smoking habits. Instead, both would seem to have been due to the exposure of the men concerned to different degrees of atmospheric pollution. The excess lung cancer mortality among British immigrants aged 45-64 would seem to have been due to their exposure in Britain to some form of atmospheric pollution to which those emigrating before 1910 had not been subject. The urban/rural lung cancer mortality gradient in South Africa would appear to reflect the increasing atmospheric pollution that is encountered in passing from rural areas to areas of increasing industrialization. (Author summary)##

01030

P. Kotin and H. L. Falk

THE EXPERIMENTAL INDUCTION OF PULMONARY TUMORS IN STRAIN-A MICE AFTER THEIR EXPOSURE TO AN ATMOSPHERE OF OZONIZED GASOLINE. Cancer Vol. 9(5):910-917, Oct. 1956.

Strain-A mice have been exposed to an atmosphere of ozonized gasoline and to a washed-air control atmospheric environment. A significant difference was found in the test-chamber mice both in multiple-tumor-bearing animals. After forty weeks of exposure there were 21 per cent tumor-bearing animals in the control mice compared with 63 per cent in our test mice. Differences between the multiple-tumor-bearing-animals have been more marked and greater significance is attached to this variation in terms of ascribing carcinogenic powers to the polluted atmosphere in our test chamber. Mice housed in a polluted atmosphere showed a consistent weight deficit when contrasted with their washed-air controls. While no statistical significance has been attributed to this in relation to tumor yield, the role of calorie restriction in depressing spontaneous and induced-tumor yield has been noted. The ubiquity of gasoline and the presence of its reaction products in urban atmospheres suggest that it be further investigated as a possible etiological influence in the increasing incidence of human lung cancer. Finally, the absence of aromatic

polycyclic hydrocarbons from the test chamber may be properly regarded as establishing the innate tumorigenic powers of the chemical substances in the test chamber. (Author summary modified)##

01040

G. B. Haydon, G. Freeman, and N. J. Furiosi

COVERT PATHOGENESIS OF NO2 INDUCED EMPHYSEMA IN THE RAT. Arch, Environ. Health Vol. 11:776-783, Dec. 1965.

The authors previously have reported effects on rats from exposure to 25 ppm NO2. Additional studies of the pathogenesis of emphysema induced by 12 ppm and of other effects resulting from 4 and 0.8 ppm of NO2 are reported. Also, reversibility of the process following exposure to 25 ppm are described. Rats exposed to 12 ppm developed respiratory disease similar to emphysema in humans. At the lower concentrations, the process was relatively covert and survival longer. A relationship appears to exist between concentration X time to the degree of pulmonary disease. In discussing extrapolation of their results to humans, it was indicated, the combination of widespread low level concentrations of NO2 in the air and the transient intermittent, very high concentrations inhaled with tobacco smoke may contribute to chronic obstructive respiratory disease.##

01060

J.B. Mudd

ENZYME INACTIVATION BY PEROXYACETYL NITRATE. Arch. Biochem. Biophys. Vol. 102(1):59-65, July 1963.

Isocitric dehydrogenase (NADP linked), G-6-P dehydrogenase, and malic dehydrogenase were inactivated by peroxyacetyl nitrate. The enzymes could be protectrd in some cases: isocitric dehydrogenase by isocitrate and NADP, the former being more effective, and G-6-P dehydrogenase by NADP but not by G-6-P. Malic dehydrogenase was not significantly protected either by substrate or coenzyme. Inhibition of these three enzymes by cadmium ion or p-chloromercuribenzoate was prevented in the same order by the presence of substrate or coenzyme. The conclusion that peroxyacetyl nitrate inactivated the enzymes by oxidizing sulfhydryl groups was further supported by the resistance of ribonuclease, containing no sulfhydryl groups, to peroxyacetyl nitrate. (Author abstract)##

01062

D.E. Rounds

ENVIRONMENTAL INFLUENCES ON LIVING CELLS. Arch. Environ. Health Vol. 12:78-84, Jan. 1966. (Presented at the Second American Medical Association Congress on Ervironmental Health Problems, Chicago, Ill., Apr. 26-27, 1965.)

This study included a consideration of only two environmental factors on an established human cell line: (1) hydrocarbon mixtures, which form a major contribution to air pollution in the Los Angeles area, and (2) a small portion of the spectral emission of sunlight. Ambient air volumes were scrubbed through either distilled water or chloroform in gas washing bottles. The resulting pollutants were suspended in water, flash sterilized, and added to double strength medium. These test solutions were compared with dilutions of a carcinogen, 3'-Me'DAB with respect to responses of an established line of human conjunctival cells in vitro. All test media produced (1) a growth stimulation, (2) an increase in chromosomal stickiness and scattering during mitosis, and (3) a decrease in a positive staining reaction for phospholipid. Treatment of conjunctival cells with either a chloroform extract of auto exhaust or a five-minute exposure to near ultraviolet light produced no marked morphological change. The combination of these treatments induced cytolysis within two hours. (Author summary modified)##

01077

I. I. Iubowe

THE EFFECT OF AIR POLLUTANTS ON THE SKIN. "DERMATITIS URBIS." General Practice 27(5):10-1, 27, May 1964.

In older individuals the visible signs of aging skin may become more apparent when continuously exposed to air pollutants. Thus, the existence of a condition which may be referred to as "city skin" is conceivable. It appears justified to conjecture that the pollutants which present respiratory hazards, with continuous long-term exposure, will also affect the epidermis and cutaneous system. The deposition of soot and dust on the skin affects bacterial growth and subsequent physiolcgical activity. Contact dermatitis due to airborne contactants such as smoke and insecticide sprays is common, as well as industrial dermatoses related to acids, organic sulfides, and other substances. It seems logical to attribute the dermatoses of the hands and face to the irritating pollutants of industrial cities. Prophylactic as well as remedial topical formulas must be devised to overcome this insidious effect of air pollution.##

01090

S. D. Murphy

A REVIEW OF EFFECTS ON ANIMALS OF EXPOSURE TO AUTO EXHAUST AND SOME OF ITS COMPONENTS. J. Air Pollution Control Assoc. 14(8):303-8, Aug. 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

The several series of experiments that are summarized in this report have demonstrated that respiratory function and activity patterns of experimental animals are altered during

brief exposure to irradiated air:auto exhaust mixtures at concentrations of total exhaust that were only two to three times those that occur in certain urban communities during maximum periods of photochemical air pollution. These physiological alterations are reversible following a single exposure of a few hours duration. Qualitatively different effects on respiratory frequency and tidal volumes occurred as a biphasic response during a single four-hour exposure to exhaust. The data indicated that the qualitative nature of the physiological response was dependent upon the relative concentrations of individual constituents with qualitatively different physiological actions. This may be important to the development and evaluation of control devices or methods, since the elimination of one or a class of chemical agents may shift the physiological-effect balance toward that produced by another agent or class of agents that still remain. (Author summary modified)##

01168

R. F. Lutmer, K. A. Busch, and P. L. DeLong

EFFECT OF NITRIC OXIDE, NITROGEN DIOXIDE, OR OZONE ON BLOOD CARBOXYHEMOGLOBIN CONCENTRATIONS DURING LOW-LEVEL CARBON MONOXIDE EXPOSURES . Atmos. Environ. 1, 45-8, 1967.

Compared to exposure to CO alone, no enhancement of blood carboxyhemoglobin concentrations was observed following 8-hour exposures of rats and mice to low levels of CO plus NO, No2, or 03. (Author abstract)##

C1218

I. M. Emel'ianov

OZONE IN THE SERVICE OF LARGE-SCALE CHEMISTRY. (Ozon--na sluzhbu bol' shoi khimii). Nature (Priroda) (12) 106-8, Dec. 1963. CFSTI,DDC: AD 600 928

Author discusses ozone as an oxidizer in the chemical industry. The advantages of ozone over other oxidizers are elucidated. As an indirect use to air pollution the document reveals those industries that use ozone and ultimately would be involved in occupational health hazards.##

01319

C.H. Thienes, P.G. Skillen, A. Hoyt, E. Bogen

EFFECTS OF OZONE ON EXPERIMENTAL TUBERCULOSIS AND ON NATURAL PULMONARY INFECTIONS IN MICE. Am. Ind. Hyg. Assoc. J., Vol. 26:255-260, June 1965.

Mice exposed to 1.5 ppm ozone for four hours per day, five days per week for two months exhibited no pathology of the lungs.

Other mice, similarly exposed, exhibited no increased susceptibility to intravenously administered Mycobacterium tuberculosis nor to BCG vaccine. Exposure of mice to 1.5 ppm ozone for two hours per day for nine to twelve months increased incidence of fatal natural pulmonary infection. The acute four hour ED50 of ozone for producing pulmonary edema was 3.66 ppm. (Author abstract)##

C1323

F.L. Estes

ANALYSIS OF AIR POLLUTION MIXTURES: A STUDY OF BIOLOGICALLY EFFECTIVE COMPONENTS. Anal. Chem., Vol. 34:998-1001, Dec. 1962. (Presented at the Air Pollution Symposium, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

The biological effectiveness of an oxidant-type air pollution mixtures was determined from the inhibition in growth of E. coli following exposure to the pollution mixture. Absorption in phosphate buffer and adsorption on a column of C-22 Firebrick coated with 20% (w./w.) disodium phosphate apeared to remove completely the effective components. Both agents removed a part of the oxidant material as determined by the phenolphthalin method. The material absorbed in the phosphate buffer markedly inhibited the oxygen consumption of leucocytes exposed to it. The buffer completely removed the as yet unidentified 302-m micron absorbing material. However, the apparent concentration in the buffer did not correspond to the apparent concentration in the gas. The data suggested that the 302-m micron absorbing material contained a biologically effective agent, which might be peroxyacetyl nitrate. (Author atstract)##

01324

E.J. Fairchild, II, S.D. Murphy, H.E. Stokinger

PROTECTION BY SULFUR COMPOUNDS AGAINST THE AIR POLLUTANTS OZONE AND NITROGEN DIOXIDE. Science, Vol. 130-861-862, Oct. 2, 1959.

Two distinct but related pathways of protection against the lethal effects of ozone and nitrogen dioxide are shown by (i) simultaneous inhalation of compounds that furnish -SH or -SS-, or both, and (ii) by injection of thiourea derivatives several days prior to exposure to these oxidant gases. The mechanism of (i) is believed similar to that proposed for the action of radiation-protective compounds; that of (ii) involves the development of a tolerance initiated by the thiourea against the oxidants. (Author abstract)##

01327

Mills, C. A.

RESPIRATORY AND CARDIAC DEATHS IN LOS ANGELES SMOGS. Am. J. Med. Sci., Vol. 233:379-386, April 1957.

Ozone or oxidant-type smogs, known to be formed by the action of sunlight upon stagnant inversion air masses containing unburned hydrocarbons and nitrogen oxides from liquid-fuel motor exhaust fumes, have been present in Los Angeles for more than a decade and are appearing with increasing frequency in other American cities as the density of motor transport vehicles increases. Although ozone was formerly considered a harmless (and perhaps beneficial) atmospheric ingredient, it is recognized that concentrations of it above 0.2 ppm are potentially harmful to exposed plant and animal life. Its maximal allowable limit for industrial in-plant workers has been reduced from 1.0 ppm down to 0.1 ppm (barely detectable by a keen sense of smell). A clearly significant association between Los Angeles smogs and rises in day-by-day respiratory and cardiac deaths in the exposed population has been shown. There no longer exists a reasonable doubt that this smog-death relationship is real and of significant proportions. The community health hazard thus generated calls for prompt and energetic measures to lessen pollution of urban atmospheres with liquid-fuel motor exhaust gases, as well as establishing the best possible control over all other known polluting sources. (Author summary)##

01330

J. L. Svirbely and B. E. Saltzman

OZONE TOXICITY AND SUBSTANCES ASSOCIATED WITH ITS PRODUCTION. A.M.A. Arch. Ind. Health 15, 111-8, Feb. 1957. (Presented at the 17th Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa., Apr. 26, 1956.)

The data obtained from acute inhalation studies indicate that ozone per se is a highly toxic substance to rats, mice, and hamsters. The ozone used in these exposures was generated from various gas mixtures and with two different ozonizers varying in current density. nfrared analysis of the scrubbed compressed air used for the toxicity studies indicated that no traces of organic impurities could be detected. Tests for possible ozone contaminants, such as oxides of nitrogen hydrogen peroxide, and free radicals (HO2, OH, HO3, O4, etc.), in a specially constructed mass spectrometer failed to reveal significant amounts of these substances, and, consequently, it is improbable that they affect the toxicity of ozone in laboratory animals. The injurious effects of ozone appear to be lessened by a previous exposure to relatively low concentrations of ozone for a short period. This tolerance was apparent for at least four and one-half weeks after exposure. (Author summary)##

01335

D. L. Coffin and F. J. Blosser

ACUTE TOXICITY OF IRRADIATED AUTO EXHAUST INDICATED BY ENHANCEMENT OF MORTALITY FROM STREPTOCCCCAL PNEUMONIA. Arch. Environ. Health, 15(1):36-38, July 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-22.)

Exposure of mice for 4 hours in each of 10 replicated experiments in atmospheres of auto exhaust yielding 100 ppm carbon monoxide, 0.35 to 0.67 ppm oxidant, 0.50 ti 1.00 ppm nitrogen dioxide, and 0.03 to 1.96 ppm nitric oxide and subsequent exposure to streptococcus aerosol produced a fivefold increase in mortality over those receiving only filtered air and identical simultaneous exposure to streptococci. Actual mortality for mice exposed to auto exhaust was 107 out of 200 and for those exposed to ambient air, 22 out of 200. Studies to determine the end point of effect showed that mortality was enhanced by exhaust containing as little as 25 ppm CO and 0.15 ppm oxidant. These results indicate toxicity of auto exhaust for mice at levels for these two components well below peak ambient concentrations. (Author abstract)##

01346

J. M. McNerney and J. D. MacEwen

COMPARATIVE TOXICITY STUDIES AT REDUCED AND AMBIENT PRESSURES. I. ACUTE RESPONSE. Am. Ind. Hyg. Assoc. J., Vol. 26:568-573, Dec. 1965.

Comparison of the acute response to toxicants at ambient and reduced pressures (5 psia; 100% O2) were made by exposing monkeys, dogs, rats, and mice for 2 weeks of continuous inhalation exposure to NO2, O3 and CC14. The experimental results show a definite reduction in the toxic response to the pulmonary irritants NO2 and O3 at reduced pressure when compared with ambient pressure exposures. With CC14, a systemic toxicant, no significant differences between the animals exposed at ambient or reduced pressure were observed. (Author abstract)##

01368

P.N. Matzen

EFFECTS OF SEROTONIN ON PULMONARY EDEMA PRODUCED BY OZONE IN MICE. Guthrie Clin. Bull., Vol. 29:102-106, 1959.

It is reported that 5HT (serotonin) given to mice following exposure to ozone is capable of decreasing the amount of edema present. When 5HT is given prior to exposure, it protects the mice from developing edema to the same extent as the

controls. One would suspect that the action of 5HT would cause a decrease in the mortality, as ozone only causes demonstrable damage in the pulmonary system and presumably causes death through producing pulmonary edema. Other experiments, in which animals were sacrificed serially after exposure and treatment, show that the action of 5HT lasts only about two hours. It may be that the action here was too transient to affect the final outcome in terms of death, or that right heart strain caused by the edema is accentuated by the constricting action of serotonin on the pulmonary vessels and results in circulatory failure. The decrease in the amount of edema is probably a result of a shift in blood volume from the lesser circulation and a drop in the hydrostatic pressure of the pulmonary capillaries. Although the data does not demonstrate the mechanism, this same pattern and degree of the response was seen by us in mice treated with hexamethonium, which has been shown to be of benefit in pulmonary edema by virtue of a blood shift to the greater circulation.##

01369

J.R. McCarroll, E.J. Cassell, W.T. Ingram, D. Wolter

HEALTH AND THE URBAN ENVIRONMENT: HEALTH PROFILES VERSUS ENVIRONMENTAL POLLUTANTS. Am. J. Public Health, 56(2):266-275, Feb. 1966. (Presented at the 92nd Annual Meeting, Epidemiology Section, American Public Health Association, New York City, Oct. 7, 1964.)

A severe and continuing air pollution problem in New York City was demonstrated. The effects of this pollution on the health of the average city dweller are subtle and often masked by symptoms stemming from other causes. Nevertheless, careful analysis of variations in health of a sizable population followed forward in time may discriminate between these different etiologic factors. Subjecting such repetitive observations to the types of discriminating analysis being developed may permit identification of many unsuspected health effects of atmospheric pollution. (Author summary)##

01402

A. P. Altshuller, L. L. Klosterman, P. W. Leach, I. J. Hindawi, and J. E. Sigsby, Jr.

PRODUCTS AND BIOLOGICAL EFFECTS FROM IRRADIATION OF NITROGEN OXIDES WITH HYDROCARBONS OR ALDEHYDES UNDER DYNAMIC CONDITIONS. Intern. J. Air Water Pollution, Vol. 10:81-98, Feb. 1966.

Measurements have been made for chemical reactants and products, condensation nuclei and aerosol formation, eye irritation and plant damage when a wide variety of individual hydrocarbons or aldehydes or mixtures of hydrocarbons are irradiated with nitrogen oxides under dynamic conditions in a large chamber. Comparison of these results under flow conditions with static measurements also made in

this study show that significant differences do occur in the chemical results obtained. Under dynamic chamber conditions, irradiated higher molecular weight paraffinic hydrocarbon-nitrogen oxide systems appear to be unreactive. The amounts of individual olefins consumed in irradiated multi-component olefin-nitrogen oxide mixtures are the same as in single component olefin-nitrogen oxide mixtures. When aromatic hydrocarbons also are included in the multi-component mixtures, interaction effects are observed. The results of the present study show that irradiated aromatic hydrocarbon nitrogen oxide mixtures not only undergo chemical reactions but also cause appreciable levels of eye irritation, plant damage and aerosol formation. It also has been shown that a representative higher molecular weight aliphatic aldehyde, propionaldehyde, when irradiated with nitrogen oxide will produce eye irritation, and moderate to heavy plant damage. The corresponding irradiated formaldehyde-nitrogen oxide mixtures did not cause damage to any of the plant varieties investigated. Using dynamic chamber conditions irradiated synthetic mixtures containing nitrogen oxides and the initial concentration levels of both olefins and aromatic hydrocarbons present in an irradiated automobile exhaust system will reasonably well reproduce the oxidant, aldehyde, eye irritation and plant damage levels measured in the irradiated automobile exhaust mixture. It is not possible to reproduce these results obtained for an irradiated automobile exhaust system, by irradiating nitrogen oxides and the initial olefin or aromatic hydrocarbon levels only. These results prove that aromatic hydrocarbons as well as olefins contribute a significant portion of the reactivity of irradiated automobile exhaust mixtures.##

01455

D. A. Fraser

THE DEPOSITION OF UNIPOLAR CHARGED PARTICLES IN THE LUNGS OF ANIMALS. Arch. Environ. Health, 13(2):152-157, Aug. 1966. (Presented at the American Industrial Hygiene Conference, Philadelphia, Pa., Apr. 30, 1964.)

The purpose of this investigation was to determine whether electrically charged airborne particles were capable of causing a difference in amount of dust deposited in respiratory tracts of animals through inhalation as compared with the amount deposited when uncharged particles were inhaled. Large New Zealand white rabbits were tested with 8 different dusts - silica of three types, vanadium pentoxide, anthracite coal, cobalt blend, cobalt fume, and graphite. Experimental and exposure methods are described. Results showed that degree of retention of particles in the respiratory tract of animals could be doubled by placing a charge of 1,000 electrons per particle on these aerosols. A qualitative analysis of mechanisms which account for the deposition of airborne aprticles in the respiratory tract indicates that, in each case, the effect of placing a unipolar electrical charge on the particles would be to increase the rate of deposition of the particles. Increase in retention does not appear to be related to the size of the particles inhaled, within the limits of size investigated - 80% were between 1.7 microns and 7.0 microns in diameter. Findings suggest that it may be possible to increase

effective dose and perhaps direct the deposition of therapeuti aerosols so that a greater deposition occurs in the alveolar region of the lungs. However, the corona discharge technique, which produces ozone and oxide of nitrogen, would not be suita for use in obtaining the high electrical charges required. Another technique needs to be devised. It is noted that particles bearing charges of 10 to 20 electrons do not increas deposition more than one or two percent, an amount not ordinari significant.##

01463

G. S. Doyle, N. Endow, and J. L. Jones

THE EFFECTS OF PHOTOCHEMICAL AEROSOLS ON EYE IRRITATION (FINAL REPT.). Stanford Research Inst., South Pasadena, Southern California Labs. June 1961.

An eye-irritation panel has been exposed to many steady-state reaction mixtures generated in a 520-cubic-foot irradiated stirred-flow reaction chamber. The reactants for one set of exposures were trace concentrations (usually 0.2 to 2.0 ppm by volume) of various hydrocarbons, predominantly olefins, and nitrogen dioxide in purified air. Reaction residence times ranged from one to two hours. Sulfur dioxide was used as an additional reactant (at a concentration of about 0.1 ppm) in a comparable set of experiments. The reacting mixtures were then evaluated for relative eye-irritating ability with and without sulfur dioxide. In addition, the reactants and some of the reaction products, especially formaldehyde, were determined, an the light-scattering and particulate content of the mixtures we measured. Some of the conclusions drawn on the basis of the conditions of reaction and exposure used in this study are: (1 Aerosols derived from the cophotooxidation of sulfur dioxide an from sulfur dioxide itself probably have little, if any, effect the eye-irritating ability of irradiated reaction mixture; (2) Trace concentrations of branched internal olefins, specifically 2-methyl-2-butene, and of a cyclic olefin, cyclohexene, can produce significant amounts of eye irritants other than formaldehyde and acrolein. (3) The use of dynamic (stirred-flo conditions considerably enhances the sensitivity of subjects to irritants; (4) Adding isobutane to a photooxidizing isobutylene-nitrogen dioxide mixture produced no significant effect; (5) The rate of response to an eye irritant is a function of the chemical nature of the irritant or irritants; a (6) Ethylene and propylene can produce significant eye irritati at realistic atmospheric concentrations. (Author summary modified)##

01483

W. F. Serat, J. Kyono, and P. K. Mueller

MEASURING THE TOXIC EFFECT OF AIR POLLUTANTS WITH LUMINESCENT BACTERIA: AN IMPROVED PROCEDURE. Preprint. 1966.

Measurements on bacterial luminescence loss in the presence of polluted atmospheres and the assessment of toxic effects have been simplified. The procedure is applicable for studies in the laboratory or on ambient air. The sensitivity of Photobacterium cells to photochemical oxidants allows measurements to be made when concentrations approximate those associated with eye irritation (0.15 microliter/liter). Results show this bioassay to detect 0.2 to 0.45 microliter/liter of oxidant for only a 15 min exposure. Thus, a bioassay can measure pollutants at levels approximate to those known to produce effects on man. (Author abstract)##

01588

W.S. Wayne, P.F. Wehrle, R.E. Carroll

OXIDANT AIR POLLUTION AND ATHLETIC PERFORMANCE. J. Am. Med. Assoc., 199(12):901-904, March 20, 1967.

The effect of Los Angeles' oxidizing type of air pollution on athletic performance was studied in 21 competitive meets of high school cross-country track runners from 1959 to 1964. Since running times tend to improve throughout the season, team performance at a meet was evaluated by the per cent of boys who failed to improve compared to their time in the previous meet on the same course. The highest correlation to team performance is that of the oxidant level in the hour before the race (correlation coefficient (r) equals 0.945 in both 1959-1961 and 1962-1964). Neither carbon monoxide, temperature, nor humidity shows any relationship to performance. The specificity of the effect to a biologically meaningful time and the very high correlation are convincing evidence of a cause and effect relationship. The mechanism by which oxidants affect performance may be directly physiological or be decreased motivation due to discomfort. (Author abstract)##

C1520

T. D. Sterling, J. J. Phair, S. V. Pollack, D. A. Schumsky, and I. DeGroot

URBAN MORBIDITY AND AIR POLLUTION (A FIRST REPT.). Arch. Environ. Health, Vol. 13:158-170, Aug. 1966.

Hospital admissions in Los Angeles were correlated with air pollution measurements and meteorological data. Once the effect of the day of the week was corrected, fluctuations in air pollution and morbidity correlated extremely highly for relevant diseases.##

01591

J. L. Jones, N. Endon, E. A. Schuck, R. G. Caldwell, C.J. Doyle

A PROGRESS REPORT ON THE CHEMISTRY OF COMMUNITY AIR POLLUTICN. Stanford Research Inst., South Pasadena, Southern California Labs. Jan. 5, 1962. 59 pp.

When mixtures of propylene and nitrcgen dioxide in concentrations of 0.1 tc 1.0 part per million (ppm) were photochemically reacted by irradiation with near ultraviolet light, the reaction prcducts were irritating to the eyes of human test subjects. The intensity of the ultraviolet light used in these laboratory experiments was comparable to 7:00 to 8:00 a.m. fall sunlight. Preliminary additional work on ethylene reaction mixtures, which were irradiated with near ultraviolet light corresponding tc 12:00 noon summer sunlight intensity, definitely produced eye irritating reacton product mixtures. The evidence frcm infrared spectra of precipitated model aerosols formed by the photccxidation of lower olefin homologs - nitrcgen oxides - sulfur dioxide mixtures at 50% relative humidity indicated that the principal constituent of the aerosol was sulfuric acid. A study of the dark reaction of ozone with olefins has been initiated. Preliminary experimental results indicate that a kinetic reaction mechanism based on a simple bimolecular reaction between ozcne and an olefin cannot account for the experimental results obtained to date. Some the-oretical quantum mechanical calculations have been made that satisfactorily account for some of the experimental rate constants in the literature. (Author summary modified)##

C1596

N.A. Renzetti E.A. Schuck

PRELIMINARY OBSERVATIONS ON THE RELATIONSHIP BETWEEN EYE IRRITATION IN SYNTHETIC SYSTEMS AND IN THE ATMOSPHERE. Stanford Research Inst., South Pasadena, Southern California Labs. 1960. 17 pp. Alsc published in J. Air Pollution Control Assoc. 11, (3) 121-4, Mar. 1961.

The eye irritaticn values fcund in Lcs Angeles smcg were tentatively related to the values found in laboratcry mixtures. In the synthetic systems, the major irritants appear to be formaldehyde, acrolein, and, possibly, Compound X. Because of the insufficient and inconclusive nature of the data obtained from atmospheric sampling, a definitive statement cannot be made on this matter. (Author summary modified)##

01603

E.A. Schuck, G.J. Doyle, N. Endow

A PROGRESS REPORT ON THE PHOTOCHEMISTRY OF POLLUTED ATMOSPHERES. Stanford Research Inst., South Pasadena, Southern California Labs. Dec. 1960. 122 pp

During the photooxidation of olefins, three reactions appear important: the reaction of olefins with oxygen atoms, with ozone, and with active intermediates. The active intermediates may be free radicals or zwitterions. The rate of disappearance of olefin, over and above that accountable by reaction with oxygen atoms and ozone, has been termed the "excess rate." The importance of active intermediates in the mechanism of olefin photooxidation is suggested by these observations: 1. Some products cannot be accounted for by simple rupture of the double bond. 2. The excess rate is proportional to the square root of the light intensity and to the square root of the initial nitrogen dioxide concentration. The major products of the photooxidation are produced by rupture of the double bond, leading to various carbonyl compounds. However, significant amounts of formaldehyde and acetaldehyde are formed from olefins in certain cases in which these compounds could not be formed by simple bond rupture. Secondary photooxidation of the initial products can also contribute to the products. Alkyl nitrites were identified among the minor products of olefin photooxidation. These nitrites are probably contributing to olefin oxidation since, as was shown previously, alkyl nitrites promote destruction of olefins as well as does nitric oxide or nitrogen dioxide. Medium to severe eye irritation was obtained with photooxidation of mixtures containing 0.5 ppm each of certain olefins and nitrogen dioxide. These concentrations are comparable to those existing in the Los Angeles atmosphere. The amount of eye irritation caused by photooxidation of auto exhaust probably may be reduced most efficiently by control of olefins rather than by control of oxides of nitrogen. This statement is based on studies of olefin mixtures of the type found in auto exhaust; these studies show that, under certain circumstances, reduction of the oxides of nitrogen can lead to an increase rather than a decrease in eye irritation. (Author summary) ##

01609

J. Ipsen C.F. Dohan

RELATIONSHIPS OF ACUTE RESPIRATORY DISEASE TO MEASUREMENTS OF ATMOSPHERIC POLLUTION AND LOCAL METEOROLOGICAL CONDITIONS (FINAL REPT.). Pennsylvania Univ., Philadelphia, Henry Phipps Inst.Henry Phipps Inst., Pennsylvania Univ. Mar. 1965. 38 pp.

Three years' studies of the relationship between industrial absenteeism to upper respiratory infections and concomitant air pollution measurements and climatological data are summarized. The purpose is primarily to investigate methods of handling

available data, and there are no attempts to hypothesize causative mechanisms between the several components. The variables considered are related in time to a fixed geographical location, which is Metropolitan Philadelphia. The study period began in September, 1960 and ended in December, 1963.##

01692

J.H. Weisburger E.K. Weisburger

CHEMICALS AS CAUSES OF CANCER. Chem. Eng. News 44, (6) 124-42, Feb. 7, 1966.

Cancer research falls into two broad groupings-diagnosis and treatment, and etiology and prevention. Diagnosis and treatment relate to the methods leading to the discovery of a cancer already present, sc that appropriate remedial measures can be used. Etiology and prevention deal with attempts to discover the causes and origins of neoplastic diseases, to understand the mechanism of their formation, and to delve into their inherent nature. The underlying idea for research on the etiology and prevention of cancer is that the disease can be prevented by modifying its ccurse or by eliminating causative or accelerating factors. This report covers a portion of cancer research pertaining to etiolcgy and prevention. In particular, the article discusses cancer induction by aromatic amines, azo dyes, nitrosamines, and mycotoxins.##

C1698

H.L. Motley H.W. Phelps

PULMONARY FUNCTION IMPAIRMENT PRODUCED BY ATMOSPHERIC POLLUTICN. Diseases Chest 45, (2) 154-62, Feb. 1964. (Presented at the 29th Annual Meeting, American Coll. of Chest Physicians, Atlantic City, N.J., June 13-17, 1963.)

Studies on three types of air pcllution and the effects of breathing such air cn pulmonary function measurements are discussed. The types are: the Los Angeles smog, allergic types related to air pollution such as seen in Tokyo-Yokohama, and industrial exposures and cigarette smoking. The Los Angeles smog was found to aggravate the severity of emphysema by increasing the residual air and impairing still further air distribution in the lungs. The Tokyo-Yokohama asthma type probably should be referred to as an allergic bronchitis, and this condition probably exists in many parts of the world. The control of the military personnel in Japan by the armed forces is unique, and this method of studying the effects of air pollution is not available in most cther areas. Air way obstruction was a consistent finding, often associated with increased residual air and hypoxia. The present outlook is less favorable than at first thought regarding complete reversibility when the subjects stay too long innthe Tokyo-Yokohama area after the condition has become manifest. The use of treatment rooms with air filtered

over activated carbon has been demonstrated to protect patients against air pollution in Los Angeles and in the Tokyo-Yokohama areas. An allergic type of bronchitis was demonstrated in a rubber works from the introduction of two chemicals in the manufacturing process, and the clinical and physiologic findings in the sensitive patients were similar to the Tokyo-Yokohama asthma type. Cigarette smoking (personal air pollution) irritates the bronchial epithelium and appears to be an important factor in rendering individuals more susceptible to allergic factors in air pollution. Cigarette smoking impairs the transfer of oxygen to the blood from the lungs in severe emphysema. (Author summary modified.)##

01699

J.B. Mudd, R. Leavitt, W.H. Kersey

REACTION OF PEROXYACETYL NITRATE WITH SULFHYDRYL GROUPS OF PROTEINS. J. Biol. Chem. 241, (17) 4081-5, Sept. 10, 1966.

Peroxyacetyl nitrate does not react with the sulhydryl groups of "native" ovalbumin, but does react with those of reduced glutathione in the presence of ovalbumin. At pH 4.5 all of the sulfhydryl groups of human hemoglobin react with peroxyacetyl nitrate, whereas at pH 7.2 the reaction is slower and is limited to two to three sulfhydryls per mole of hemoglogin. Ribonuclease in the reactive form is not inactivated by peroxyacetyl nitrate even when the oxidant is in 300-fold molar excess. Amino acid analysis of the protein shows a decrease in cystine and increase in systeic acid. Reduced ribonuclease is prevented from regaining activity if exposed to peroxyactyl nitrate in the sulfhydryl form. The inactivation of papain by peroxyacetyl nitrate depends on the amount of free protein sulfhydryl at the time of gas exposure. (Author summary)##

01737

Bachman, C. H., R. D. McDonald, and P. J. Lorenz

SOME EFFECTS OF AIR IONS ON THE ACTIVITY OF RATS. (EXPERIMENT NO. 3 OF BIOLOGICAL ACTION OF IONIZED PARTICLES IN THE ATMOSPHERE.) Intern. J. Bioclimatol. Biometeorol. (Leiden), 10(1):39-46, July 1966. 14 refs.

In order to determine the effects of measured concentration of ionized air (mobility, about 1.0 sq. cm./v.sec.) upon the gross motor activity of rats, a chamber was used with a flexible dielectric floor which made possible the electrical detection of motor activity. Exposure of 9 groups of 11 rats each to various positive and negative ion concentrations produced pronounced effects in gross motor activity, attacks on the aluminum foil ground plate, urination, defecation, sleeping during the experiment, and respiration. The lowest ion concentrations were the most effective. The ion current drawn by each rat varied markedly, indicating the delicate balance that exists between a biological system, the electrostatic charges of its surrounding, and the aerial ions.##

C1738

R. D. McDonald, C. H. Bachman, and P. J. Lorenz

SOME PSYCHOMOTOR AND PHYSIOLOGICAL TESTS ON HUMANS EXPOSED TO AIR IONS. Aerospace Med. 38 (2), 145-8 (Feb. 1967).

Humans were exposed to air ions by inhalation only. The ion current to each subject was measured. Both psychomotor and physiological tests were performed with ions of both polarities. Reaction time measurements were ambiguous. In a vigilance task both negative ions and positive ions reduced the number of omissions, the positives being most effective. Neither polarity affected the heart rate. Reduction in respiration rates occurred for both polarities of ions and the control during the ion exposure. The reduction for positive ions was greater than for the control, the reduction for negatives was less than for the control. Measurements of d.c. potential between forehead and ear showed no correlation with ions. Results of a mood questionnaire also showed no correlation. (Author abstract)##

01753

K. Luomanmaki

STUDIES ON THE METABOLISM OF CARBON MONOXIDE. Ann. Med. Exptl. Biol. Fenniae (Helsinki) Suppl. 44, (8) 1-55, 1966.

The purpose of the present study was to investigate the metabolism of CO in regard of the distribution of CO between the major CO pools and the possibility of oxidation of CO in an intact organism. The dog was used as an experimental animal. All the experiments were done under barbiturate anesthesia and using a closed rebreathing system. The main results obtained were concerned with the following aspects: distribution of CO; oxidation of CO; and endogenous formation of CO at rising COHb. The body of CO stores was discussed in the light of previous and present findings. The validity of a rebreathing method for measuring the rate of endogenous formation of CO was considered in view of the present findings. An approach to study the function of myoglobin applying the Haldane technique on the present results of the distribution of CO was described. (Author summary)##

C1773

P. Drinker

HEALTH ASPECTS OF AIR POLLUTION. Arch. Environ. Health 4, 11-19, Mar. 1962. (Presented at the Management Conference, 26th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 25-26, 1961.)

Air pollution is essentially a problem of overcrowding. The offensive pollutants, by and large, are present in very low concentrations. Given a reasonable chance nature can dispose of the objectionable substances, but when the load of aerial garbage becomes excessive from too much human activity in too small an area, objections are prompt. For a community to act as a unit generally takes legislation. There is no way to make a law popular which tells modern man that we propose to curtail his freedom. He can't get in his car and drive anywhere he wishes. Perhaps the law will limit the number of cars on the road, just as the fire department limits the size of the audience in a theater or the building inspector limits the passengers on elevators. We control pollution today by controlling the emission of pollutants. Factories, steel mills, power plants, locomotives, and ships have been living under control laws for some time, but they are enforced only to the extent the public demands. Until recently we had no restrictions on emissions by motor vehicles. Because its problem was severe, Los Angeles County and later the State of California adopted restrictive measures designed to control objectionable exhausts from motor cars. There is no convincing evidence that air pollution is presently endangering the public health in the United States. We'd like to blame unsolved problems like the increase in bronchogenic cancer on air pollution, but the available evidence is unconvincing. California has not shown that the health of its public is impaired by the pollution resulting from its heavy motor traffic, yet they propose to reduce this pollution. Pittsburgh was among the first of our large dirty cities really to clean up. Los Angeles County (and California) intend to control emissions from motor cars. These are examples other communities can and must follow. (Author summary) ##

01785

R. Ehrlich

EFFECT OF AIR POLLUTANTS ON RESPIRATORY INFECTION. Arch. Environ. Health. 6, (5) 76-80, May 1963.

It is apparent from the experimental data that ozone and nitrogen dioxide increase the susceptibility of laboratory mice to respiratory infection caused by inhalation of Klebsiella pneumoniae. Sufficient information is available which indicates that exposure to air pollutants can reduce and make the tracheobronchial tree more vulnerable to airborne bacteria. If the concentration of the pollutant is sufficiently high, permanent damage can occur. The experimental data obtained are compatible with a picture of transient damage of approximately one day, varying with concentration, followed by essential recovery, insofar as mortality is concerned. At lower concentrations this damage is probably only temporary, and recovery follows. (Author summary modified) ##

01794

V. Pirila, L. Noro, A. Laasanen

AIR POLLUTION AND ALLERGY. Acta Allergol. (Copenhagen) 18, 113-30, 1963

After describing some examples of acute air pollution episodes, the authors give a brief review of natural air pollution from the allergological point of view. Cultural air pollution is considered under two headings: indoor or local, and outdoor or general. The capacity of some chemical present in outdoor air-SO2, H2S, NH3, Be and F-to provoke allergic diseases is discussed on the basis of the literature and personal investigations. Finally some figures and examples are given regarding the quality and degree of air pollution in the USA and in Finland. The authors stress the difficulty which arieses in fixing the maximum allowable concentrations for general air pollution, owing to the wide variations in physiological response in general and in allergic reactivity in particular. (Author summary modified)##

01844

P. Kotin

AIR POLLUTION WITH CANCERIGENIC SUBSTANCES. Acta, Unio Intern. Contra Cancrum 19, (3-4) 469-71, 1963.

Polluted urban air must seriously be regarded as one of the factors responsible for the increased incidence of lung cancer. Carcinogenic agents have been identified in polluted urban air, and extracts have resulted in the induction of malignant tumors following skin painting or subcutaneous injection in inbred strains of mice. Further, aerosols of ozonized gasoline, in conjunction with multiple influenza infections, have resulted in the induction of human type squamous cell carcinomas in C57 black mice following inhalation exposure. Evaluation of the carcinogenic potential of polluted urban air requires an assessment of the role of (a) respiratory tract irritants, (b) the physical aspects of particulates in relation to deposition in the tracheobronchial tree, and (c) chemical compounds potentially acting as anti-carcinogenic agents. (Author summary)##

01855

J.E. Remmers O.J. Balchum

EFFECTS OF LOS ANGELES URBAN AIR POLLUTION UPON RESPIRATORY FUNCTION OF EMPHYSEMATOUS PATIENTS (REPT. ON STUDIES DONE FROM JULY 1, 1964 - FEB. 1, 1965.) Preprint. 1965.

Four patients with chronic broncho-pulmonary disease have been studied under conditions during which they breathed either highly filtered air or the ambient Los Angeles air. Patients residing in the filtered air rooms and who had moderately severe emphysema showed improvement in lung measurements. Oxygen consumption declined steadily while the patients were residing in the filtered air rooms. The significance of this is not known and will be studied further. (Author abstract) ##

01883

D. A. Lynn

REPORT OF CHEMICAL MUTAGENESIS. Preprint. 1964.

Author discusses the science of genetics as it relates to the following: (1) chemical mutagenesis, (2) molecular genetic mechanisms, (3) mutations, (4) birth defects, (5) somatic mutations and aging, (6) chemical mutations, and (7) extrapolation to man. It is shown that airborne chemicals (as pollutants) influence the mechanism of mutagenesis in man. ##

01893

O. J. Balchum, R. Buckley, S. Ievey, J. Bertolino, H. Swann, and T. Hall

STUDIES IN EXPERIMENTAL EMPHYSEMA. Arch. Environ. Health 8, 132-8, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

Serum antibodies to lung tissue are produced in guinea pigs injected with lung homogenate from animals exposed to noxious gases and from normal animals. Microscopic sections of the lungs revealed the presence of an interstitial pneumonitis. Guinea pigs administered the supernatant obtained by low-speed centrifugation of homologous lung homogenate, and others injected with the sediment obtained by high-speed centrifugation of this supernatant, developed marked changes in the pulmonary vasculature and interstitial pneumonitis. These pathological alterations of the lungs are presumed to be a result of antigen-antibody reactions. Morphological alterations resembling those of human emphysema were not detected. (Author summary) ##

C1916

V. A. Fjazanov.

CRITERIA AND METHODS FOR ESTABLISHING MAXIMUM PERMISSIBLE CONCENTRATIONS OF AIR POLLUTION. Bull. World Health Organ. (Geneva) 32, 389-98, 1965.

Experience in the USSR in establishing standards for air pollution control is described. It is emphasized that health considerations must be main criterion in deciding permissible concentrations, which constitute the "hygienic" standards ultimately to be achieved. Economic and technological reasons may dictate temporary "sanitary" standards, which modify the requirements for a limited period. "Technological" standards relate to the economic and technological consequences of air pollution and do not concern health. The maximum permissible concentrations of toxic substances used in toxicology and industrial hygiene are not sufficiently stringent for general use, and control standards are therefore based on the results of tests carried out on animals and human subjects. Tests on animals show that certain concentrations of toxic substances cause functional changes (e.g., in higher nervous activity, cholinesterase activity, and excretion of coproporphyrin) as well as a number of protective adaptational reactions. The results are used to establish maximum permissible concentrations of pollutants within a 24-hour period. Tests on human volunteers provide a basis for determining the maximum average concentrations at a given time. Reactions to odorous substances give the olfactory threshold and the level of concentration causing respiratory and visual reflexes, as well as subsensory effects such as changes in light sensitivity and in the activity of the cerebral cortex. Morbidity statistics also provide evidence of harmful pollution, but cannot serve as a basis for establishing maximum permissible concentrations, which should aim not only at preventing illness but also at avoiding pathological and adaptational reactions. (Author abstract)##

01957

A. P. Krueger, P. C. Andriese, and S. Kotaka

THE BIOLOGICAL MECHANISM OF AIR ION ACTION. THE EFFECT OF CO2 PLUS IN INHALED AIR ON THE BLOOD LEVEL OF 5-HYDROXYTRYPTAMINE IN MICE. Intern. J. Biometeorol. 7, (1) 3-16, 1963.

Mice inhaling positively ionized air exhibited a significant rise in the blood level of 5-hydroxytryptamine (5-HT)BL. This effect was duplicated by non-ionized air to which CO2(plus) was added but did not occur when the same amount of either nonionized CO2 or CO2(-) replaced CO2(plus). The rise in (5-HT)BL was associated with physiological changes that parallel those appearing after the injection of 5-HT or after administration of iproniazid. Some of the animals exposed to CO2(plus) in air became ill and suffered tissue damage attributable to excessive concentrations of 5-HT. A few of the mice died and at autopsy pulmonary and enteric lesions were found which also were reasonably ascribed to the increased 5-HT BL. The physiological, pathological and biochemical changes described furnish additional support for the 5-HT hypothesis of air ion action presented in earlier publications. There is good reason to believe that some of the known biological effects of gaseous ions involve other mechanisms. (Author abstract)##

01977

W. A. Young, D. B. Shaw, and D. V. Bates

PULMONARY FUNCTION IN WELDERS EXPOSED TO OZONE. Arch. Environ. Health 7, 337-40, Sept. 1963.

Seven men engaged in argon-shielded electric arc welding were examined clinically for evidence of respiratory damage attributable to ozone. The mean concentration of ozone in the welding shop was 0.2 to 0.3 ppm. One man had symptoms associated with the argon-shielded electric arc welding. Three had a slight cough associated with smoking, and two of these, both of whom gave a past history of pneumonia, had abnormal physical signs in the chest. The measurements of pulmonary function were: vital capacity, functional residual capacity (FRC), maximal midexpiratory flow rate, indirect maximum breathing capacity, and carbon monoxide diffusing capacity at rest and on exercise. Four of the seven showed no abnormality in any of the pulmonary function measurements. Three men had vital capacities below those predicted. In one, the only subject with symptoms possibly attributable to ozone, it was an isolated finding. In a second it was accompanied by a diminished FRC and in a third by a slight-to-moderate diminution in all the other measurements. However the history and physical examination suggested that this man had some pre-existing pulmonary disease. These findings indicate that exposures to these low concentrations of ozone do not cause impairment of air flow or of pulmonary diffusion. However, recent evidence that slightly higher levels of ozone produced a decrease in the one-second forced expiratory volume suggests that they are approaching the limit of safety.##

01987

R. G. Hinners

ENGINEERING THE CHRONIC EXPOSURE OF ANIMALS TO LABORATORY PRODUCED AUTOMOBILE EXHAUST. J. Air Pollution Control Assoc. 12, 527-30, Nov. 1962. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

A laboratory facility designed for studies to determine the effects of lifetime exposure of experimental animals to auto emissions is described. The emissions produced simulated atmospheric concentrations and conditions generally found in the air of a city like Los Angeles.##

01992

P. V. V. Hamill

ATMOSPHERIC POLLUTION, THE PROBLEM - AN OVER-ALL VIEW. Arch. Environ. Health 18 241-7, Sept. 1960. (Presented at

the 12th Annual Meeting, American Academy of Occupational Medicine, Williamsburg, Va., Feb. 12, 1960.)

Some epidemiological and laboratory studies are reviewed. Statistical evidence suggests a relationship between air pollution levels and mortality rates from lung cancer notwithstanding smoking habits. Health statistics regarding air pollution episodes in the United States and Europe are given.##

C1993

J. A. Hathaway and R. E. Terrill

METABOLIC EFFECTS OF CHRONIC OZONE EXPOSURE ON RATS. Am. Ind. Hyg. Assoc. J. 23, 392-5, Oct. 1962.

Young male rats were exposed to 0.8-1.5 ppm. ozone five days per week for a period of eighteen weeks, and various quantitative analyses of urinary constituents were done. A significantly lower titratable acidity and a higher pH was found in urine from test animals than from controls. Under a handicap of having narrow openings through which to obtain food, mean food intake and weight gain were consistently less in exposed than in control rats. When the openings were made uniformly larger, food consumption and weight gain were comparable in both groups. (Author abstract)##

02116

TOXICITY OF NITROGEN DIOXIDE. Stanford Res. Inst. J. 2, (4) 10, Sept. 1966.

The toxicity of NO2 is being studied by Stanford Research Institute because of its occurrence as a combustion product in smog, in tobacco smoke, and its production also as a reaction product of ensilage. In general, for the higher concentrations of NO2 (4 ppm and above), the deleterious effects were roughly proportional to concentration and duration of exposure. Young rats exposed to 12 ppm NO2 continued to grow for the first nine months, but at a reduced rate. The lungs became considerably larger and heavier. At 25 ppm NO2 rats gained little or no weight during the 43 days exposure, but developed lung disease. When returned to clean air, they gained weight rapidly and their breathing improved. All rats, at rest, exposed to all concentrations of NO2 breathed more rapidly than the controls. The rise in respiratory rate roughly corresponding to (3 The rise in respiratory rate roughly corresponding to NO2 concentration. It is important to note that at the low concentration of NO2, such as can occur in severe smog, the disease, known medically as emphysema, could not be induced in the rat within its normal lifetime. Hence it is unsafe to conclude that, because higher concentrations of NO2 can be damaging, even fatal, to rats, low concentrations are harmful to the lungs of man. That remains to be demonstrated, although the evidence is suggestive.##

02122

Y. Palti, E. De Nour, and A. Abrahamov.

THE EFFECT OF ATMOSPHERIC IONS ON THE RESPIRATORY SYSTEM OF INFANTS. Pediatrics 38, (3) 405-11, Sept. 1966.

Atmospheric ions produced by air-flow friction or ionizing radiation have an effect on non-contagious diseases. In this study, infants were placed in close contact with a source of negative or positive ions and their reactions, particularly of the respiratory system were noted. Negative ions reduced the duration of spastic attacks in children suffering from asthmatic (spastic) bronchitis and also reduced tachypnea. Opposite results were obtained with positive ions; they had a deleterious effect on the patients.##

02163

C. H. Bachman, R. D. McDonald, and P. J. Lorenz.

PEAK CHANGES IN ELECTROCARDIOGRAMS OF RATS EXPOSED TO AIR IONS. Intern. J. Biometeorol. 10, (1) 101-2, 1966.

Electrocardiograms were obtained from rats exposed to air ions both by inhalation and by non inhalation. Progressive changes were noted in the peak heights of the P, Q, and S waves when ions were inhaled. No such changes were observed when ion exposure was by external surface contact alone. (Author abstract)##

02173

A. S. Josephson.

IMMUNOLOGIC METHODS IN AIR POLLUTION RESEARCH. Arch. Environ. Health 8, 143-6, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

Author discusses the use of immunologic techniques, both direct and indirect, to investigate the possible effects of air pollution such as alteration of proteins and sensitivity reactions to pollutants. Immunology also provides an approach to study the body defense mechanisms to pollutants.##

02213

J.T. Mountain

DETECTING HYPERSUSCEPTIBILITY TO TOXIC SUBSTANCES AN APPRAISAL OF SIMPLE BOOD TESTS). Arch. Environ. Health 6, 357-65, Mar. 1963. (Presented at the 27th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 24-25, 1962.)

From observations of an apparent aggravation of a hereditary defect (Wilson's disease) by exposure to vanadium and from work on laboratory animals made tolerant or susceptible to ozone and nitrogen dioxide, the conclusion has been drawn that the susceptibility of the individual in relation to environmental exposure should be a matter of concern. It is pointed out that tests for detecting susceptibility to hemolytic effects from drugs and other chemicals have been developed which can also be useful in predicting an individual's response to conditions associated with his employment. A number of factors such as stress, diet, and disease are known to affect erythrocyte and tissue enzyme activity and are discussed in relation to their contribution to the physiologic burden imposed by the working environment. Tests for detection of chemically sensitive red blood cells are considered in reference to their use in distinguishing persons hypersusceptible to effects from exposure to substances encountered in industrial operations. (Author summary) ##

02223

S.D. Murphy, C.E. Ulrich, U.K. Leng

ALTERED FUNCTION IN ANIMALS INHALING CONJUGATED NITRO-OLEFINS. Toxicol. Appl. Pharmacol. 5, (3) 319-30, May 1963, (Presented in part at the Third Inter-American Conference on Occupational Medicine and Toxicology, Miami, Fla., Aug. 1961.)

Increased total pulmonary flow resistance and tidal volumes and decreased respiratory rates of guinea pigs and decreased voluntary activity of mice occurred during inhalation of the vapors of conjugated nitro-olefins at concentrations near or below the threshold for human, sensory detection. Increasing concentrations increased the magnitude of the effects. Comparison of the effects of 2-nitro-2-butene, 3-nitro-3-hexene, and 4-nitro-4-nonene indicated that the effectiveness on pulmonary function was inversely related to the carbon chain length. However, 4-nitro-4- nonene was slightly more active than the butene and hexene in producing depression of mouse activity. At the low concentrations tested, the effects of nitro-olefins were reversible when the animals were returned to clean air. Injection of atropine sulfate overcame the increased pulmonary flow resistance induced by 4-nitro-4-nonene. The response of animals to inhaled nitro-olefins qualitatively resembles effects which have been observed when animals inhale high concentrations of irradiated automobile exhaust. These effects are, however, relatively nonspecific and are produced by several other irritating vapors and gases which have been shown to be present in measurable quantities in exhaust mixtures. (Author summary) ##

02247

P.K. Das, P.S. Sinha, B.K. Srivastava, A.K. Sanyal

STUDIES ON CILIARY MOVEMENT. PART II. EFFECTS OF CERTAIN PHYSICAL AND CHEMICAL FACTORS ON CILIARY MOVEMENT IN FROG'S

OESOPHAGUS. Arch. Intern. Pharmacodyn. 153, (2) 367-78, Feb. 1965.

The effects of some physical and chemical factors viz. atmospheric temperature and seasonal variations, osmotic pressure, hydrogen ion concentration, some cations and anions, have been studied on one type of ciliated epithelium concerning the esophagus of a frog. All experiments were designed so that only one factor remains variable keeping all others constant.##

02263

S. S. Wilks

TOXIC PHOTOOXIDATION PRODUCTS IN CLOSED ENVIRONMENTS. Aerospace Med. 34, 838-41, Sept. 1963

The evidence of carbon monoxide production from the action of light and oxygen on many classes of organic substances and compounds indicates the necessity for adequate protection of susceptible materials from the ravages of the combination of light and oxygen in small, sealed environments designed for human occupancy. Materials to be used in spacecraft should be thoroughly tested for their stability to effects of radiation. Materials within the vehicle should, as far as possible, be shielded from certain components of the spectrum. Appropriate methods for CO elimination should be a permanent installation.##

02266

M. C. Battigelli, T. F. Hatch, P. Hengstenberg, and R. J. Mannella

TRITIATED THYMIDINE LABELING IN THE STUDY OF ACUTE INJURY FROM AIR POLLUTANTS. Arch. Environ. Health 12, 747-50, June 1966. (Presented at the Eastern Section Meeting, American Thoracic Society, Hartford, Conn., Oct. 22, 1965.)

The need to quantify pulmonary injury in small laboratory animals exposed to irritant aerosols has suggested the use of DNA synthesis rate as indicator of cellular homeostasis. Labeling DNA synthesis by an autoradiographic technique employing tritiated thymidine, the effects of inhaled mixture of diluted diesel exhaust, of nitrogen dioxide, and of phosgene, in separate experiments, were followed over a period of a few days from the inhalation. The preliminary results indicate that the DNA synthesis rate offers the advantage of a simple numerical index, well suited to quantifying injury. However the sensitivity of this method appears limited to the effects accompanied by histological abnormalities. The first evidence of change appears within one or two days from the exposure and it tends to disappear a week or so after the exposure. (Author summary)##

02277

H.E. Swann, Jr O.J. Balchum

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. UV. EFFECTS OF ACUTE SMOG EPISODES ON RESPIRATION OF GUINEA PIGS.
Arch Environ. Health 12, 698-704, June 1966 (Presented at the 25th Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa. Apr. 30, 1964.)

Measurement of total expiratory flow resistances were made on guinea pigs on days of unusual conditions of weather and smog. When these resistances were compared with routine monthly measurements on the same animals, significant increases in resistance were found at oxidant levels of approximately 0.30 ppm or more. Also, significant increases in resistance were observed when approximately 40% of alert levels of the oxides of nitrogen, carbon monoxide, and hydrocarbons were present. Only when high temperature was accompanied by approximately 0.30 ppm oxidant did a significant increase in resistance occur. During a smog episode when alert levels of oxidant and 25% of alert levels of carbon monoxide and hydrocarbon were recorded on two successive days, older gunea pigs breathing ambient air had highly significant increases in resistance. Alert smog levels apparently act as a respiratory stress which was more obvious in the older animals. Some animals had little or no response to the smog while some animals greatly responded and had quick recovery; other animals greatly responded to the smog and had a slow recovery or no recovery and died. This suggests a possible individual difference in sensivity to smog among animals of the same species. The pathological findings on the two animals that died during the episode indicated severe pulmonary abnormality. Also, some animals that died within 45 days following the episode and had high resistances during the episode also had pathological pulmonary changes. Gowever, others that had high resistances and died had no such alterations. Although high smog levels produced a significant increase in pulmonary resistance, this response may or may not be related to the degree of impairment.##

02288

W.C. Hueper

ENVIRONMENTAL AND OCCUPATIONAL CANCER HAZARDS. PART I OF SYMPOSIUM: CHEMICAL CARCINOGENESIS. Clin. Pharmacol. Therap. 3, (6) 776-813, Dec. 1962

The growth of an environmental carcinogenic spectrum composed of recognized, suspected, and potential human carcinogens of chemical, physical, and parasitic nature should provide an impressive warning to all concerned with the maintenance and protection of the health and well-being of mankind to exert all possible effort to develop methods and facilities by which sources of production, channels of dissemination, routes of

exposure, prospective and actual target organs and tissues, and number and types of individuals exposed to natural and man-made carcinogens can be more readily and reliably identified. It is essential that, where possible, human contact with environmental carcinogens be totally eliminated or, whenever such a stringent measure appears impractical or impossible, reduced to a minimum with respect to degree, frequency, duration, and number of persons exposed. While the presently available methods of identifying carcinogenic agents are admittedly slow and not totally adequate, experimental observations and their implications in man demand that first and dominant consideration be given to the protection of the community against actual or potential cancer hazards. In such a decision, the health and life of the general public should receive the benefit of doubt without any reservation. (Author summary modified)##

02306

K.M. Sancier, G. Freeman, J.S. Mills

ELECTRON SPIN RESONANCE OF NITRIC OXIDE-HEMOGLOBIN COMPLEXES IN SOLUTION. Science 137, (3532) 754-5, Sept. 7, 1962.

The electron spin resonance spectra of solutions of nitric oxide-hemoglobin and nitric oxide-methemoglobin, and whole blood treated at room temperature with nitric oxide, all exhibit resonance with a line width of 83 gauss, a g-value of 2.03, and a spin intensity corresponding to one unpaired electron spin per heme. The minimum detectable concentration of these nitric oxide complexes in solution is 0.00001 M. Solutions were stable in a nitrogen atmosphere but when exposed to air in the absence of nitric oxide the spin intensity decreased with z half-life of about 5 hours. A preliminary examination of blood of rats exposed for 1 and 9 days to 10 ppm of nitric oxide in air showed no electron spin resonance. (Author abstract)##

02332

T. R. Lewis, F. G. Hueter, and K. A. Busch.

EFFECTS OF ATMOSPHERES CONTAMINATED WITH IRRADIATED AUTOMOBILE EXHAUST ON REPRODUCTION OF MICE. Preprint. 1966.

The exposure of mice to irradiated automobile exhaust prior to mating significantly impaired reproductive function in male members of sexual pairs. The impairment was expressed at various stages of reproduction: conception, fecundity, and infant survival. These effects imply that the chromatin content of the sperm was altered. This experiment suggests mutational effects on mammalian cells from components or subsequent products of irradiated automobile exhaust. Significantly, the concentrations of these pollutants were similar to those present in many urban communities today. A direct toxic effect on infant mice was noted during postnatal exposure to irradiated automobile exhaust. Death rates during the first 8 days of life were higher compared to those for controls. (Authors' summary)##

02357

E.G. Giel

AIR POLLUTION AND YOUR LUNGS. Preprint. (Presented at the Symposium on Respiratory Diseases, Syracuse, N.Y., May 14, 1964.)

The adverse effects of man-made air pollutants on man's health, with particular reference to respiratory diseases, are discussed generally in this paper.##

02367

H.L. Motley

IONIZED AIR AND SMOG EFFECTS ON LUNG FUNCTION IN MAN. Preprint. 1964.

This is a negative report of the effect of breathing air ions either positive or negative on lung function measurements in chronic pulmonary disease in man. No significant changes in pulmonary function have been demonstrated from breathing negative or positive ions in high concentrations employing a battery of tests. Ion densities of approximately 500,000 ions per ml. were delivered at the level of the nose of the subject. The air in the hospital room was filtered over activated carbon to remove smog. There was no air filtration over activated carbon for patients followed on the long range studies breathing ions at home. (Author summary modified)##

02420

H.W. Phelps

THE EFFECTS OF AIR POLLUTION ON MILITARY PERSONNEL IN JAPAN (FIRST ANNUAL PROGRESS REPT. - PERIOD ENDING 30 JUNE 1962). Army U.S. Medical Command, Japan. 1962. 19 pp.

Extensive pulmonary function studies on patients with the so-called Tokyo-Yokohama asthma reveal this disease is much more incapacitating than was originally believed. Surveys on individuals living in the Kanto Plain (Tokyo-Yokohama area) show that approximately five percent of the military population are affected. Follow-up data on individuals who were evacuated from this area because of T-Y asthma reveal forty-two percent of them remain symptomatic and have abnormal pulmonary function studies after six weeks in the United States. Thirteen patients who have had this disease for many months or who have had this disease during more than one tour in the Kanto Plain have developed all of the clinical signs of emphysema. Pulmonary function studies confirm their disability. The severity of the symptoms and the attack rates

seem to correlate best with periods of increased smog. The Kanto Plain area is geographically and climatologically ideal for the formation and retention of smog. (Author abstract)##

02437

C. E. Push, Jr.

AIR POLLUTION ASTHMA IN OSAKA, JAPAN (FINAL REPT. DEC. 15, 1964 TO DEC. 14, 1965). Yodogawa Christian Hospital, Osaka, Japan. Jan. 6, 1966. 36 pp. (Rept. No. J-222).

A relationship of air pollution and respiratory illness has been shown in the Kanto Plain area among the armed forces but there is still no agreement as to the exact relationship and whether or not the disease as seen in the yokohama area is a distinct clinical entity. The prcbability is that it is not; however, the relationship of asthma and air pollution is very striking and certainly causes an increased amount of difficulty in those who have had a previous history of allergy. Ten cases out of 77 studied during cne year, were rejected because of disease processes other than chronic or acute bronchitis, or bronchial asthma. Sixty-seven cases were studied by questionnaire and pulmonary function tests were completed on 54. One case showed definite relaticnship of air pollution to his respiratory illness. Further studies of forthcoming seasonal incidence of acute respiratory illness, and of more cases of acute bronchitis may prove that the type of disease known as Tokyo-Yokohama asthma does occur in other areas as well, probably on the basis of industrialization and climate producing the smog which in turn produces exacerbatien of the respiratory illness. (Author abstract modified)##

02483

G. Freeman, N. J. Furiosi, and G. B. Haydcn.

EFFECTS OF CONTINUOUS EXPOSURE OF 0.8 PPM NC2 ON RESPIRATION OF RATS. Arch. Environ. Health 13, 454-6, Oct. 1966.

Rats were exposed during their natural lifetimes to 0.8 ppm of No2 and examined for clinical and anatomical changes. They grew normally and their behavior was similar to that of controls, except for a sustained elevation in respiratory rate of about 20%. Tachypnea began almost immediately upon exposure and became exaggerated during the latter part of life. Occasional minimal changes in morphology of bronchiolar epithelial cells were not accompanied by either microscopic or gross criteria of obstructive disease. The persistent tachypnea suggests, however, that exposure of a species with a longer life span might develop lesions like those in the rat breathing concentrations greater than 0.8 ppm. Also, adjunctive pollutants and diseases in man may enhance the effects of low concentrations. (Author summary)##

02485

E. Schuck, E. R. Stephens, and J. T. Middleton.

EYE IRRITATION RESPONSE AT LOW CONCENTRATIONS OF IRRITANTS. Arch. Environ. Health 13, (5) 570-5, Nov. 1966.

The linear relationship between reported eye irritation and formaldehyde concentration in simulated atmosphere experiments does not hold when the formaldehyde concentration is below 0.3 parts per million (ppm). Subjects may experience equal irritation at irritant concentrations differing by an order of magnitude. Thus most subjects experienced the same irritation intensity at 0.05 ppm of formaldehyde as they did at 0.5 ppm. At irritant concentrations less than 0.3 ppm, the rate of blinking determines to an important extent the intensity of eye irritation which the subject detects. The eyes of human subjects can readily detect and react to as little as 0.01 ppm formaldehyde. From these simulated atmosphere experiements, one can predict that the concentrations of formaldehyde and peroxyacetyl nitrate found in atmospheres polluted with photochemical air pollution can account for most of the detected eye irritation. It should be noted that the experimental design used in these experiments does not preclude the postulated presence of an unknown short-lived irritant formed in the early stages of the photochemical reactions. However, these results indicate that such postulated irritants are not required in order to account for the observed irritation. (Author summary)##

02533

M. Sim and R. E. Pattle

EFFECT OF POSSIBLE SMOG IRRITANTS OF HUMAN SUBJECTS. J. Am. Med. Assoc. 165, (15) 1908-13, Dec. 14, 1957

Various aerosols and gaseous mixtures were administered to adult male volunteer subjects by two methods, one using a mask, the other involving a chamber large enough for all subjects to occupy at the same time. The main effects of sulfur dioxide gas and sulfuric acid mist inhaled in this way were an increase in airway resistance and appearance of rales, with rhinorrhea and lacrimation. Two subjects exposed to sulfuric acid mist developed long-lasting bronchitic symptoms; the addition of water vapor increased the mean particle-size of the sulfuric acid mist and intensified its irritant effects. These acid substances were neutralized and their irritant effects abolished by adding either ammonia gas or magnesium oxide smoke to the atmosphere. While acrolein and crotonaldehyde were highly irritant, formaldehyde was less so, acetaldehyde and its higher homologues were almost nonirritant. It was evident that neither the concentration of sulfur dioxide nor the total aldehyde content of an atmosphere is an adequate index of its irritant action, especially on people handicapped by disease or old age. (Author abstract)##

02539

(INHALED NOXIOUS POLLUTANTS.) Pollutants nocifs inhales. (Part of Chapter 1: Les pollutions et "nuisances d'origine industrielle et urbaine. Tome 1. Leur prevention et les problemes scientifiques et techniques qu'elle pose en France.) Premier Ministre, Delegation generale a la recherche scientifique et technique. 13-7, June 1966.

This information on inhaled noxious pollutants, which is presented in brief semi-outline form, deals with: chronic and acute effects, influence of dusts on the lungs, influence of non-carcinogenic pollutants, influence of bacteria and viruses, and principal areas of concern in research. Pollutants must be considered both for their independent effect and for that which is conditioned by the state of health of the person such as that of persons with cardiovascular impairment or chronic bronchitis. Reactions from a number of pollutants, including ozone, nitrous vapors, and carbon monoxide, are of great concern. Research studies are being pursued with synthetic atmospheres in relation to synergistic actions; with studies of the atmosphere in certain areas of Paris during a normal period and during a period of smog; with toxicological studies of certain chemical agents, particularly sulfur dioxide, carbon monoxide, and various fluorine compounds, with a view of fixing their limits of tolerance; with the carcinogenic potential of chemical agents as pollutants; and with consideration of the respiratory tree as influenced by inhaled chemical agents and studies of respiratory insufficiencies. This information is given in a section of Chapter 1 of this monograph.

02617

H. G. Boren

CARBON AS A CARRIER MECHANISM FOR IRRITANT GASES. Arch. Environ. Health 8, (1) 119-24, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

The question of whether focal areas of lung damage can be produced by mechanisms which concentrate relatively large amounts of irritant gases in sharply localized portions of lung has been investigated by exposing mice to carbon with absorbed NO_2. Neither a group of control nor mice exposed to inhalation of carbon alone demonstrated any anatomic abnormality of the lung. Mice inhaling NO_2 in concentrations of 250 ppm or greater developed pulmonary edema, but neither single nor repetitive exposures produced parenchymal lung lesions. Mice exposed to inhalation of carbon upon which NO_2 was absorbed developed focal destructive pulmonary lesions. The thesis is presented that carbon acted as a carrier mechanism whereby high local concentrations of NO_2 within the lung were achieved. Carbon is not considered to be a unique particulate carrier nor is NO_2 considered to be a unique absorbed irritant to produce the observed effects. The significance of carbon insofar as air pollution is concerned is not only that it indicates the inhalation of potentially polluted air but also that it at times

may allow the transport of damaging substances into the lung, depending upon the conditions present when the carbon was formed and the subsequent history of the newly formed carbon particle before it is inhaled. (Author summary)##

02742

E. J. Cassell

THE UNSOLVED PROBLEM: THE EFFECT OF AIR POLLUTION ON HUMAN HEALTH. Preprint. 1963

The danger of air pollution to human health was dramatically demonstrated at Donora, Penna. in 1948. In the 15 years that have passed a great deal of research has been done to elucidate the nature of the effects on human health as well as their cause. Several substances often found in our air have been shown to have harmful effects but it has always required greater concentrations of these substances than are naturally found in air to cause ill effects. While some morbidity and mortality studies have given suggestive results again the specific goal has eluded investigations. The results of some well designed studies of more recent years are reviewed for their usefulness but they too fail to solve the problems. The solid conclusions that it is presently possible to make are given, but the implications of the unsolved problems for further research in air pollution are discussed. The impact on air pollution control of the present state of knowledge is presented. (Author abstract)##

C2781

A. L. Finkner, J. Monroe, and J. Fleischer

DESIGN OF A HOUSEHOLD SURVEY FOR AIR POLLUTION RESEARCH NASHVILLE MORBIDITY SURVEY. Preprint. 1959.

A sample of 3,032 sampling units having an expectation of 3,060 households was drawn in Nashville, Tennessee, and parts of its urban fringe to collect, by personal interview, morbidity and mortality data from eligible households in the area. Interviewers were unable to contact 171 households and had refusals from 135 others to account for most of the non-response. A total of 282 sampling units failed to have any eligible households within them. The interviewing began January 19, 1959 and was completed by March 11, 1959. The field force consisted of two full-time supervisors, two part-time supervisors and 29 interviewers. In general, the quality of the interviewing was high. Relative sampling errors for a few selected items varied from 0.52 percent for estimated total number of people in eligible households to 2.14 percent for estimated total number of deaths occurring in eligible households during the previous five years from date of interview. As might be expected, in the estimation of proportions of households exhibiting specified characteristics, the variance of the binomial is a good approximation to the variance of the ratio estimate. (Author summary)##

02811

C. E. Ulrich and M. F. Sqbecki

EFFECT OF OZONE ON BODY TEMPERATURE REGULATION IN THE RAT.
Preprint. 1965

The effect of ozone on rectal temperature in the rat was studied. Dose response, time response, and rate of recovery were investigated. Data indicate that ozone induced hypothermia is rapidly initiated and is maintained only during the exposure, and that recovery begins promptly upon termination of the exposure. Additional information derived from the study indicates that pre-exposure to ozone or thyroidectomy does not significantly affect ozone-hypothermia, but pretreating with dinitrophenol will completely block the response. (Author abstract)**

02826

J. M. Lagerwerff, G. L. Kane, and G. H. Thornberg

THE EFFECTS OF REPEATED AND PROLONGED EXPOSURE TO HIGH CONCENTRATIONS OF OZONE ON THE VISION OF AIRLINE PILOT.
(Minnesota Univ., Minneapolis, Inst. of Tech. May 1961.
80 pp.

Twenty-eight human volunteers were exposed to ozone concentrations of 33, 58, and 83 parts per hundred million, by weight, for a gross total of 709.75 hours in three and six hour periods. Twenty-two of the subjects completed the entire series of six experiments. These experiments were designed to determine if prolonged exposure to atmospheric ozone in concentrations expected to be present inside the cabin of future high altitude commercial aircraft, when outside air is being used for cabin pressurization and ventilation, has any direct or indirect influence on the visual parameters of flight personnel. Three hundred and two vision test batteries, comprising a total of 3426 separate vision tests, were accumulated. Comparison of the pre-and post exposure data indicated significant changes in lateral phoria, divergence, convergence, visual fields and night vision in the majority of subjects. The effects are considered to constitute a safety hazard for future commercial aviation, and further study is urgently recommended. In addition to the human experiments, thirty rabbits, divided into five equal groups, were exposed to similar ozone concentrations for twenty-three hours per day and to higher concentrations for eight hours per day, up to a maximum period of four and a half months. Three of the rabbits developed corneal nebulae and maculae, while all animals exhibited marked lethargy during periods of actual ozone exposure. (Author abstract)**

02842

H. W. Korth

EFFECTS OF THE RATIO OF HYDROCARBON TO OXIDES OF NITROGEN IN IRRADIATED AUTO EXHAUST. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, 64 pp., Oct. 1966
HEW 999-AP-20

As a part of a series of investigations of the problem of vehicle exhaust as an air pollutant, photochemical reactions are being studied in detail by the use of large dynamic irradiation chambers. In these studies exhaust, generated by test vehicles on a dynamometer, is diluted with air and irradiated to simulate the effects of sunlight under mixing conditions similar to those in the atmosphere. The irradiated mixture is used to study chemical reactions and to evaluate plant damage and human eye irritation. In this second series of irradiation tests performed by the Public Health Service, the ratio of total hydrocarbon (HC) to oxides of nitrogen (NOx) was varied between 1-1/2 and 24. Hydrocarbon concentrations were varied from 3 ppm to 12 ppm total carbon; oxides of nitrogen concentrations were varied from 1/4 ppm to 2 ppm. Greatest plant damage occurred when both the HC/NOx ratios and hydrocarbon concentrations were high. The levels of eye irritation were highest at the higher chamber hydrocarbon concentrations. For a given hydrocarbon level, chemical reaction rates were highest at the high HC/NOx ratios. (Author abstract) ##

02969

H. Petri

ASSESSING THE HEALTH HAZARDS OF GASEOUS AIR POLLUTIONS. Staub (English Transl.) 25, (10) 50-7, Oct. 1965.
CFSTI: TT 66-51040/10

Many gases and vapours in molecular dispersion have pathophysiologic effects, that is, effects dangerous to health. Various substances can be detected by smell even if present in air in small quantities, and at a certain concentration they may become a nuisance; these substances are, for instance, mercaptans, butyric acid, acrolein and amines, such as trimethylamine; hydrogen sulphide, carbon disulphide, pyridine, etc. cause nuisance at slightly higher concentrations. Sulphur oxides, hydrogen fluoride and other acid aerosols, further, ozone, chlorine, bromine and nitrous gases are dangerous to health, because they irritate body tissue. As a result of the increase in road traffic the odourless carbon monoxide has become very important. The biological assessment of gas or vapour emission with regard to their effect on man, and special effects of these substances are discussed in detail. (Author summary) ##

03076

S.D. Murphy, J.K. Leng, C.E. Ulrich, H.V. Davis

EFFECTS ON ANIMALS OF EXPOSURE TO AUTO EXHAUST. Arch. Environ. Health 7, 60-70, July 1963 (Presented at Air Pollution Research Conference, Los Angeles, Calif., Dec. 5-7, 1961.)

The effects on experimental animals of brief exposure (2-6 hrs.) to exhaust polluted atmospheres were studied. The concentrations of exhaust gases in the experimental atmospheres were varied between levels which approximated polluted ambient atmospheres and concentrations several times greater than present community pollution levels. Changes in physiolcgical function of experimental animals, which could be objectively measured, were produced during exposure to these polluted atmospheres. Analyses presented are for comparative purposes. Comparison of concentrations in irradiated and nonirradiated atmospheres of approx. equal dilution ratios shows the photochemical formation of aldehydes, nitrogen dioxide, and total oxidant at the expense of nitric oxide and olefin. Measurements of pulmonary function, spontaneous activity, and mortaility of impaired aniamals were the most sensitive indicators of effects. Most of these effects rapidly returned to preexposure normal when the animals were returned to clean air.##

03082

L.D. Scheel, O.J. Dorbrogcrski, J.T. Mountain, J.L. Svirbely, H.E. Stokinger

PHYSIOLCGIC, BIOCHEMICAL, IMMUNOLOGIC AND PATHOLCGIC CHANGES FOLLOWING OZONE EXPOSURE. J. Appl. Physiol. 14, (1) 67-80, Jan. 1959

A detailed study of physiolcgic, bicchemical, immunologic and pathologic changes resulting from acute and repeated acute injuries due to inhalation of ozone is reported. This study defines the primary chemical reaction of ozone with constituents of the body, the response of the body to the presence of the toxic substance, the physiologic functional alterations produced by acute and repeated acute injuries due to inhalation of this gas and the pathology produced by these injuries due to inhalation of this gas and the pathology produced by these injuries in rabbits, mice and rats. The data presented show that ozone reacts with the proteins of lung tissue ot produce a severe cellular irritation which alters cell wall permeability and leads to severe pulmonary edema. Repeated acute injuries are shcwn tc cause the development of fibrosis of the bronchioles and alveclar ducts, which limits the reserve capacity of the lung by causing the Hering-Breuer reflex to stop inspiration befcre ccmplete inhalation can take place. Immunologic and bicchemical changes observed which are characteristic cf this type of injury are reported. It has been

shown that ozone reacts in a random fashion with proteins to produce a heterogeneous antigen which will stimulate an antibody response in rabbits. The antigen created was shown to have characteristics similar to denatured protein. The severe limitation of pulmonary function by reduced tidal volume and edema and the resulting pathologic changes are reported and discussed. (Author abstract)##

03083

W.S. Spicer, Jr., W.A. Reinke, H.D. Kerr

EFFECTS OF ENVIRONMENT UPON RESPIRATORY FUNCTION. II. DAILY STUDIES IN PATIENTS WITH CHRONIC OBSTRUCTIVE LUNG DISEASE. Arch. Environ. Health 13, 753-62, Dec. 1966

The effects of selected metecrologic changes and air pollutants upon the mean daily values of ten respiratory function tests obtained from small groups of patients with chronic bronchitis or bronchial asthma have been assessed for two seven-week study periods. A logical biostatistical approach, which places chief reliance upon the multiple regression technique, has been used to sort out major effects from a mass of data. The most important environmental-physiologic relationships appeared to be those associated with temperature, wind speed, barometric pressure, and sulfur dioxide levels. Two distinct patterns of physiologic response were found. In the final analyses, total lung capacity (TLC) and residual volume (RV) were used to exemplify the volume group and airway resistance at functional residual capacity and percentage of the forced bital capacity exhaled in three seconds (FEV 3.0%) the "resistance" group. Airway resistance and TLC increased as temperture decreased. Airway resistance increased and FEV 3.0% fell in both patient groups and RV increased in patients with asthma either 14 or 38 hours (or both) following a rise in sulfur dioxide in the second study where the range of sulfur dioxide levels was greater than in the first study. Airway resistance increased and FEV 3.0% decreased 24 hours after a fall in barometric pressure while TLC and RV rose in patients with chronic bronchitis 14 hrs. after a drop in wind speed. Particular care has been taken to point out that a direct cause and effect relationship cannot be implied from these significant findings. (Author summary)##

03115

F.L. Petrilli

THE EFFECTS OF AIR POLLUTION ON HUMAN HEALTH. European Conf. on Air Pollution, Strasbourg, 1964. pp. 5-24.

A summary is presented of the situation in the countries listed below, as given in the replies of national Rapporteurs to questionnaires. The countries included: Belgium, France, the Federal Republic of Germany, Ireland, Italy,

Luxembourg, Netherlands, Norway, Sweden, Switzerland and the United Kingdom. European research on the effects of air pollution on human health is summarized under three main headings: (1) Epidemiological Research which takes into account immediate or short-term effects and the effects of long-term exposure; (2) Experimental Research; (3) Current Research, in Belgium, France, Italy, Norway, Sweden and the United Kingdom.##

03151

M. Corn and G. Burton

THE IRRITANT POTENTIAL OF POLLUTANTS IN THE ATMOSPHERE. Arch. Environ. Health 14, 54-16, Jan. 1967. (Presented at the Eighth Annual American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif. Mar. 2-4, 1966.)

Irritant substances have been thought of as producing acute, and eventually chronic, surface inflammation of tissues. Over the last ten years the meaning of the term "irritant" has been altered; it is now used to describe a group of substances which elicit other types of human and animal responses, as well as inflammation. Concentrations, size and distribution of irritant substances in polluted atmospheres and the concept of the nature of irritants are described. Author recommends that airborne particulate pollutants should be assessed with respect to aerodynamic particle size because chemical composition of particles has been demonstrated to vary with size, and only certain particle sizes present in polluted atmospheres are capable of reaching receptors after inhalation by man. Among the defects of present routine sampling methodologies are size distribution of sampled particles, the optimum density of sampling stations for the procurement of reliable results, and the irritant potential of pollutant mixtures when single pollutants are evaluated.##

03252

H. G. Tucker

EFFECTS OF AIR POLLUTION AND TEMPERATURE ON RESIDENTS OF NURSING HOMES IN THE LOS ANGELES AREA. Preprint. 1961.

The general problem considered in this study is the determination of the immediate effects of air pollution and temperature of air pollution and temperature on the health and well-being of human populations. In order to determine the existence of any immediate effects a very special population consisted of residents in certain nursing homes in Los Angeles County. The advantages of using such a population are that it is a fairly complete records are kept of its mortality and morbidity. A most important advantage in using this population is that if there are any human subpopulations which are immediately adversely affected by air pollution and/or temperature, this one should certainly be included among them. It has already been shown that

mortality and morbidity among nursing home patients have increased during periods of extremely high temperature, suggesting that this aged, chronically ill population is generally sensitive to environmental influences on health. The data used in this study were the total number of deaths recorded each day over a four year period from the beginning of 1956 through the end of 1959; the total number of transfers from rest homes to hospitals due to the onset of illness during this same time period; daily maximum temperature measurements; and daily measurements of levels of two air pollutants, total oxidant and carbon monoxide.##

03254

R. P. Sherwin, S. Winnick, and R. D. Buckley

THE RESPONSE OF LACTIC ACID DEHYDROGENASE POSITIVE ALVEOLAR CELLS IN THE LUNGS OF GUINEA PIGS EXPOSED TO NO2. Preprint. 1966.

A method has been developed for determining the ratio of alveolar cells to alveoli, utilizing lactic acid dehydrogenase reactivity of alveolar cells to identify the cells and gelatin inflation of the lung to permit counting of the alveoli. Ratios have been d determined on the lung sections from guinea pigs previously exposed to NO2 (15 ppm continuously for three months) and have been compared with those of lungs from control animals. Significant differences were found between the two animal groups and the ratios within each group have been found to be consistent. Applications for related areas of investigation have been suggested. (Author summary)##

03257

R. D. Buckley and O. J. Balchum

EFFECTS OF NITROGEN DIOXIDE ON LACTIC DEHYDROGENASE ISOZYMES. (Arch. Environ. Health 14, 424-8, Mar. 1967.) 1965

Lactic dehydrogenase (LDH) isozyme patterns were examined in guinea pigs after 26, 33 and 40 days continuous exposure to 15 ppm nitroge dioxide (NO2). Isozymes were separated from lung, liver and kidney tissue homogenates from exposed and unexposed animals by disc electrophoresis. Gel samples were incubated with NAD and lactate, and nitro-BT tetrazolium was employed as coupling agent. Relative distributions of the isozyme was determined by densitometry. Inhalation of NO2 resulted in a decrease in the relative amounts of the fast-moving (aerobic) isozyme and an increase in the slow-moving (anaerobic) isozyme in lung. Isozyme patterns in liver and kidney were not significantly altered following any of the exposure periods. (Author summary)##

C3258

R. D. Buckley and O. J. Balchum

ENZYME ALTERATIONS FOLLOWING NITROGEN DIOXIDE EXPOSURE. (Arch Environ. Health 14, 687-92, May 1967.) 1966

Oxygen consumption aldolase and lactic dehydrogenase determinations were performed on guinea pig lung, liver, kidney and spleen tissue homogenates following continuous exposure to 10 ppm nitrogen dioxide for varying periods of time. Inhalation of NO2 resulted in increased oxygen consumption values in lung but also in kidney tissue for each exposure period. Oxygen consumption in liver and spleen homogenates was significantly elevated following thirty-two days exposure but did not show a consistent increase after other exposure periods. Aldolase activity was significantly elevated in lung following twelve days, and in lung and liver following thirty-two days exposure to NO2. Significant decreases in aldolase activity were noted in lung, kidney and spleen after twenty-six days exposure. LDH values were increased in lung, liver and kidney as a result of inhalation of NO2. The possibility of the presence of circulating substances resulting from the interaction of NO2 and lung or blood tissue, and/or a general physiological 'stress' reaction were suggested as possible explanations for enzyme and oxygen consumption alterations observed in kidney, liver and spleen. The possible effects of respiratory infection on the metabolism of lung tissue was also discussed. (Author summary)##

03261

V. Richters, R. P. Sherwin, H. D. Buckley, O. J. Balchum, and Ivler

PSEUDOMONAS: DELAYED OCCURRENCE IN LUNG TISSUE CULTURES FROM GUINEA PIGS EXPOSED TO NO2. Am. Rev. Respirat. Diseases 94, (4) 569-73, OCT. 1966.

In a tissue culture study of the lungs of guinea pigs previously exposed to 10 ppm of NO2, it was noted that numerous cultures produced Pseudomonas aeruginosa after one week or more of in vitro life. This previously unreported phenomenon is considered to be unique since bacterial contamination or the use of infected tissue for culture results in diverse types of bacterial growth, either shortly after explanation or after the use of contaminated media. Furthermore, lung cultures of non-exposed guinea pigs were only occasionally positive for Pseudomonas aeruginosa and there were no instances of bacterial growth of any type in the numerous cultures of various other tissues, human and animal, prepared simultaneously in an identical manner. Finally, the number of guinea pig lungs yielding cultures positive for Pseudomonas increased in accordance with the duration of prior exposure of the animals to NO2. (Author abstract)##

03269

G. C. Buell, E. Jeung, and W. Fenninger

CHEMICAL CHANGES IN RESPIRATORY TISSUE FOLLOWING OZONE EXPOSURE. Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963. 140-52 pp.

Four female white rabbits, approximately six months old weighing between five and six pounds, were used in each experiment. One served as a control, two were exposed simultaneously to ozone at a concentration of 1 ppm for one hour, and the fourth rabbit was exposed to a concentration of 5 ppm for one hour. Immediately following exposure the animals were sacrificed. The interaction of inhaled ozone in vivo with proteins in lung tissue results in the formation of carbonyl compounds. This does not eliminate other tissue components as potential sources of carbonyls. The carbonyls are most likely derived from the proteins collagen and elastin. There is a possibility that the aldehydes among the carbonyls may be further oxidized to acids. Those carbonyls already identified by means of gas chromatography include acetaldehyde, propionaldehyde, isobutyraldehyde, methyl ethyl ketone, isovaleraldehyde and acetone.**

03270

W. J. Hamming and R. G. Lunche

EFFECTS OF EMISSIONS OF ORGANIC SOLVENTS ON LOS ANGELES PHOTOCHEMICAL SMOG. Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd Monterey, Calif., 1963 153-84 pp.

Irradiation of mixtures of solvents and nitric oxide or solvents and auto exhaust will produce ozone, aerosols and eye irritation. The aromatic solvents produce the most eye irritation, and their effectiveness is about 6/10 of that of auto exhaust. The mixed ketones and chlorinated hydrocarbons are the next most active in producing eye irritation, and their effectiveness is about 1/5 that of auto exhuast; methyl ethyl ketone, the low-boiling alkanes, and the mixed alcohols are on the average, much less active in producing eye irritation. The high-boiling alkanes are unreactive. Relative to their effect on aerosol formation, or growth of aerosol, the solvents tested may tentatively be listed in the following order: 1. Aromatic Solvents, at 2 ppm - 1.2 ppm auto exhaust - greater increase in growth of aerosols 2. Chlorinated Hydrocarbons = Next in order - half the effect of aromatics or less 3. Mixed alcohols = Questionable effect on aerosol growth 4. LB Alkanes = Questionable effect 5. Mixed Ketones = May have slight effect 6. MEK = No effect 8. HB Alkanes = No effect. There is a general tendency for high concentrations of solvent to form more ozone than low concentrations. The quantities of ozone formed by irradiation of various solvents have the following orders of magnitude: (a.) Aromatics and HB alkanes produce about 1/15 ppm ozone per ppm of solvent. (b.) LB alkanes and chlorinated hydrocarbons

produce about 1/20 ppm ozone per ppm of solvent. (c.) Mixed ketone (probably the active one is isobutyl ketone), 1/25 ppm ozone per ppm of solvent. (d.) Mixed alcohols and MEK form about 1/30 ppm ozone per ppm solvent. When mixed with auto exhaust at only 4 ppm the LB alkanes, HB alkanes and mixed ketone show ozone formation that has significant difference from that of auto exhaust alone. Under similar conditions both aromatic and Cl-HC show positive, but significant effect on ozone formation. A larger and more significant effect might be shown is 8 ppm of these solvents had been used. The effect of solvent on the formation of ozone when mixed with auto exhaust is much less than when they are mixed with nitric oxide and irradiated.##

03394

E.J. Catcott

EFFECTS OF AIR POLLUTION ON ANIMALS. World Health Organ. Monograph Ser. 46 (Air Pollution), 1961. pp. 221-31.

The report of animal morbidity and mortality which followed major air pollution episodes would be regarded critically. The investigations of these acute and intense exposures to air pollution have been done retrospectively. It is significant that the owners' reports of injury to animals could not be corroborated by professional observers at the Donora disaster. The high rate of animal mortality which allegedly occurred at Poza Rica is generally in contradiction to the information concerning the relative susceptibility to air pollutants of animal species which have been studied experimentally. The synergistic roles of physiological and of external environmental influences on reactions to air pollution indicate that the interactions of many factors may be necessary to produce critical situations. In contrast to the paucity of information concerning natural exposure to most air-borne pollutants, the effects of fluorides on animals have been defined well. Laboratory research has provided important information concerning the effects of specific pollutants on animals. Mice, rabbits, guinea-pigs, rats and monkeys have been utilized to demonstrate the toxic properties of such air pollutants as sulfur dioxide, sulfuric acid, hydrogen sulfide, ozone, nitrogen dioxide, organic compounds, and some dusts. Information which has been obtained by artificial exposure of animals is providing some indices of both human and animal effects to be expected from natural exposures. A well-integrated attack, in the field and in the laboratory, will be necessary to divulge the true details of the biological effects of polluted air. (Author summary modified)##

03421

H. H. Schrenk, H. Heimann, G. D. Clayton, W. M. Gafafer, H. Wexler

AIR POLLUTION IN DONORA, PA. (¬EPIDEMIOLOGY OF THE UNUSUAL SMOG EPISODE OF OCTOBER 1948, PRELIMINARY REPORT). Public

Health Bulletin No. 306. 1949. 203 pp.
GPO, HEW

In the latter part of October 1948, Donora, Pennsylvania, a town of about 13,000 population, containing a zinc plant and a steel and wire plant, experienced a large number of acute illnesses and 20 deaths during a heavy smog. This report is based upon a carefully made epidemiological study, approached from the biological, the engineering, and meteorological point of view. The data collection began after the episode was over and included: (1) Studies of acute morbidity by house-to-house canvass, records of fatal and hospitalized patients, and finally, study of general morbidity; (2) Study of chronic morbidity by dental examinations of school children, by certain chest roentgenograms, and morbidity of selected groups of individuals; (3) Study of mortality records of the community and comparing them with similar records of neighboring towns; (4) Atmospheric studies of air pollutants; (5) Evaluation of industrial plant effluents; (6) Evaluation of air contaminants from other sources; (7) Description of the topography of the valley in which the town is located; (8) Micrometeorological studies of the valley; (9) Description of the weather during the acute episode in October, 1948. Detailed descriptions of the methods used are presented since it was believed they would be useful to other making similar studies. The study showed that the cause of the episode was an accumulation in the atmosphere of chemical irritants, this accumulation resulting from the weather inversion which existed in this part of the country during the fateful days. The parts played by all sources of chemical air contamination are discussed. A section is devoted to discussing the specific agent or agents probably responsible for the illnesses, and it is deduced that no one agent can be indicated. It was likely that it was due to a chemical irritant (possibly sulfur dioxide) plus particulate matter, although, because of the lack of knowledge about the toxic effects of low concentrations of the irritant gases, this cannot be said with certainty.##

03427

D. J. Thompson.

MORTALITY, 1948-1957, AND MORBIDITY, 1957, AMONG PERSONS RESIDING IN DONORA, PENNSYLVANIA DURING THE SMOG EPISODE OF OCTOBER, 1948. Pittsburgh Univ., Pa., Graduate School of Public Health. 1957. 257 pp.

Following the acute episode of air pollution in Donora, Pa., in Oct. 1948, the Pulbic Health Service conducted a community survey on a systematic one-third sample of the households of Donora listed in the 1947 files of the tax assessor of the borough. Information was obtained on 4092 residents at that time. Early in 1957, by use of mailed questionnaires and personal interviews, slightly more than 99% of these same individuals were contacted and information was obtained on the 1957 prevalence and 1948-57 incidence of certain chronic hospitalization and medical services received, place and cause of

any deaths, residence, occupation, smoking history, and other related information. Earlier data for these persons were not known by the interviewers in 1957. The essential findings of the follow-up study were that persons who reported acute illness at the time of the smog episode demonstrated subsequently higher mortality and prevalence of illness than did other persons living in the community at that time. Furthermore, persons who complained of more severe acute illness in 1948 demonstrated greater subsequent morbidity and mortality than persons with milk complaints, with some evidence in the data that this was related to the cardiorespiratory illness which antedated the 1948 episode are removed from the comparisons, the differentials in subsequent illness experience between the acutely ill and those who did not experience illness, are narrowed considerably. Finally, no substantial or consistent relations between environmental variables and health experience could be demonstrated. Some of the questions arising from this study are discussed briefly.##

03463L

R. Lewis, M. M. Gilkeson, Jr., and R. W. Robison

AIR POLLUTION AND NEW ORLEANS ASTHAM (PART I - THE STUDIES, RESULTS, DISCUSSION, CONCLUSIONS). Tulane Univ., New Orleans, La., School of Medicine and Tulane Univ., New Orelans, La. June 1962. 130 pp.

A series of investigations was carried out by Tulane University, to detect the substances and sources of specific air contaminants which affect susceptible persons to produce outbreaks of asthma. Several methods were tried with regard to the effectiveness of methods of measuring the severity of asthmatic attacks, and found to be of no particular value toward evaluating severity. Analysis of data from the clinic which pertained to asthma, and analysis of meteorological data, disclosed that asthma outbreaks were most commonly associated with winds of low speed from south to southwest. Occasional outbreaks occurred with wind from the north and northeast. A number of air pollutants were collected and analyzed and their prevalence was compared with the prevalence of asthma outbreaks. A statistically significant relationship was found between the daily asthma admissions at the Charity Hospital emergency clinic and the prevalence of air pollutant, a poor-combustion particle with associated silica. All possible sources of this material were not examined; however, samples taken at the city dump revealed large quantities of this particle. Differences in attack rates were observed for two groups of people, with a higher attack rate among the group residing closer to the city dump. To confirm the above conclusions it would be necessary to collect materials from the smoke plumes, isolate the various constituents, and test them in known human responders to identify the particular substance causing the outbreaks, or to take action to prevent the smoldering of the dumps.##

03490

K. F. Lampe, T. J. Mende, W. E. Deichmann, M. G. Eye, and L. F. Palmer

EVALUATION OF CONJUGATED NITRO-OLEFINS AS EYE IRRITANTS IN AIR POLLUTION. Ind. Med. Surg. 27, (8) 375-7, Aug. 1958.

Distinct eye irritation owing to 2-nitro-2-olefins at low concentrations in air has been observed by two laboratories. For the butene and hexene derivatives, concentrations between 0.1 and 0.5 parts per million by volume have been shown to produce irritation within three minutes. For the corresponding nonene, irritation was observed only at concentration above 1.0.##

03519

H. H. Hechter and J. R. Goldsmith

AIR POLLUTION AND DAILY MORTALITY. Am. J. Med. Sci. 241, 65, 581-72, 588, May 1961.

Analysis has been made of the relationship between various environmental factors and daily cardiac and respiratory deaths in Los Angeles County from 1956 to 1958. It was found that the variables, when studied over time, exhibited a distinct seasonal pattern plus some irregular oscillations. The seasonal component from each series was isolated and removed by the techniques of harmonic analysis. A correlation analysis, adjusting for the autocorrelation remaining in the residuals, indicated that changes in the daily air pollution level, as measured by the oxidant and carbon monoxide concentration, exerted no detectable influence upon the day-to-day mortality pattern. It is emphasized that these findings, which deal only with the acute terminal response of man to variations in the daily air pollution level, do not mitigate the importance of air pollution as a possible menace to the health and well-being of man. (Author abstract)##

03529

H. W. Phelps

PULMONARY FUNCTION STUDIES USED TO EVALUATE AIR POLLUTION ASTHMA DISABILITY. Military Med. 126, (4) 282-6, Apr. 1961.

Since 1950 an unusual asthmatic condition has been observed with increasing frequency throughout the Kanto Plain (Tokyo-Yokohama region), and has become one of the major causes of morbidity for U.S. military personnel and their dependents in the area. The incidence is greater in the dry winter months; this time of the yr. there are also increased occurrences and concentrations of smog. The condition which was originally known as Yokohama asthma, since it 1st was noted around that city in 1946, is now becoming known as "air pollution astham." The symptoms of wheezing, coughing, and shortness of breath usually begin at night or in the early morning hours, with the onset from 2 weeks to 1 1/2 yrs. after entry into the area, and usually occur in normal healthy individuals without a past history of asthma or other allergic states. The individual"s military effectiveness is

greatly reduced and in some cases it has been necessary to evacuate such personnel frcm the area. To aid in predicting which personnel should be evacuated and which could safely remain, a series of pulmonary function tests were undertaken. The 1st 100 patients treated constituted the 1st group to be studied; the control group was of 52 paratroopers located in an area in the Plain where the incidence of asthma was considerably lower. Three other groups studied were those patients seen only as out-patients, those who were hospitalized, and those requiring evacuation to the continental U. S. All patients with the disease showed a marked airflow obstruction; those of the hospitalized group indicated considerabbly mcre obstruction than the other groups. Studies of the vital capacity of the lungs of persons in the study groups, however, indicate very little variation from the normal. It is concluded that pulmonary function testing would provide the element of objectivity needed in determining the individual personnel to be evacuated.##

03530

W. D. Wagner, C. J. Dobrogorski, H. E. Stokinger

ANTAGONISTIC ACTION OF OIL MISTS ON AIR POLLUTANTS (EFFECTS ON OXIDANTS, OZONE AND NITROGEN DIOXIDE). Arch. Environ. Health 2, 523-34, May 1961

Both mineral and motor oil mists are capable of reducing acute lethal effects of the respired oxidants, ozone and nitrogen dioxide, in mice. The protection is demcnstrable only after a latent period following exposure to the oil mist; simultaneous exposure to oil mist and oxidant results in a moderate intensification of toxicity. The protection following a single few hours' exposure to the oil mist persists for several days, but is no lcnger demonstrable after 8 or 9 days. The protection is not markedly dependent on concentration above a minimal time-intensity of the oil mist exposure; 1 ppm oil mist, if inhaled for a few days, will provide measurable protection. The effective particle-size range cf the oil mist for the mouse was found to lie between 0.5 and 1.2 micron mean diameter at a standard geometric deviation cf 1.6. Histologic examination of the respiratory tract was characterized by marked macrophagic mobilization and infiltration following an oxidant or oil-plus-oxidant exposure, but not frcm an oil exposure alone. Despite protection of the lung from the acute effects of potent respired oxidants, tolerance ot ozone developed., indicating incomplete protection (surface covering) of the lung by oil. Repeated inhalation of oil mists for a few weeks appears to result in a decrease in the protection. A tentative mechanism of oil-mist protection against the oxidants, O3 and NO2 has been proposed. !Author summary)##

03593

H. Cullumbine, R. E. Pattle, and P. Burgess

THE TOXICITY OF FOG. C.D.E.E., Porton, England, Medical Division. 1954. 14 pp.

The effects on humans and cattle due to air pollution episodes are reviewed. Health statistics are presented dealing with respiratory and cardiac diseases in relation to these episodes. Experimental data are given relative to the toxicity of sulfuric acid mist and sulfur dioxide as primary toxic components of contaminated fog.##

03603

W. M. Diggle J. C. Gage
THE TOXICITY OF OZONE IN THE PRESENCE OF OXIDES OF NITROGEN. Brit. J. Ind. Med. (London) 12, 60-4, 1955.

The concentration of ozone which causes 50% mortality to rats and mice exposed for one period of four hours has been found to be in the region of 10 to 12 p.p.m. The cause of death is acute pulmonary oedema. Dilute mixtures of ozone and nitrogen dioxide in air react in part to give nitrogen pentoxide, the amount produced depending on the concentrations of the reactants. The toxic effects of ozone and nitrogen pentoxide are qualitatively similar, though the latter is about three times as active as the former. The effects are additive and the observed increase in the toxicity of an ozone atmosphere brought about by the presence of oxides of nitrogen can be adequately attributed to the nitrogen pentoxide present. The effect of these observations on the assessment of the toxic hazard from industrial ozone concentrations is discussed. (Author summary, modified)##

03606

J. R. Goldsmith L. Breslow

EPIDEMIOLOGICAL ASPECTS OF AIR POLLUTION. J. Air Pollution Control Assoc. 9, (3) 129-32, Nov. 1959.

The studies described are concerned with how air pollutants damage the health of groups of people, and the basic problems that recur in all of these studies. Five potentially measurable health effects of air pollution are now of concern: air pollution may cause acute sickness and death; or aggravate chronic diseases such as chronic bronchitis, emphysema, or lung cancer; thereference with important bodily functions such as the exchange of gases in the lung or gas transport by the blood; adverse bodily symptoms such as eye irritation and difficulty in breathing; groups

of persons may become dissatisfied with or leave their places of residence or work. Air pollution is a threat to health including social health. Epidemiolcgic studies can provide a well rounded picture of all of these effects, and thus a basis for their prevention through scund ccmmunity planning and rational controls.##

03619

H. E. Stokinger

EVALUATION OF THE HAZARDS OF OZONE AND CXIDES OF NITROGEN (FACTORS MODIFYING TOXICITY). A. M. A. Arch. Ind. Health No. 15:181-90, March 1957. (Presented at the International Ozone Conference, Chicago, Ill., Nov. 30, 1956.)

Experimental evidence is presented that ozone in single acute exposure is a highly poisonous substance to laboratory animals. No experimental evidence was found that this toxicity is modified to a significant degree by the presence of nitrogen oxides that may accompany ozone production. Seven factors have been experimentally found that may modify the toxicity of ozone. Four of these, youth, physical exertion, alcohcl, and respiratory infection, tend to augment the injuricus response or act to the detriment of the host; the remainder, intermittent exposure, premedication, and pre-exposure, either reduce or eliminate the injurious effects of ozone. Consideration has been given these factors in the evaluation of possible hazards to populations from ozone-containing smogs. (Author summary)##

03620

W. D. Wagner, O. J. Dorbrogorski, and H. E. Stokinger

OZONE TOXICITY STUDIES. III. CHRONIC INJURY TO LUNGS OF ANIMALS FOLLOWING EXPOSURE AT A IOW LEVEL. A.M.A. Arch. Ind. Health, No. 19:514-22, Dec. 1957.

Chronic injury has been shown tc result in the lungs of small animals fcllowing repeated inhalation of a common pollutant, ozone, at concentrations only two tc three times greater than currently reported in urban areas. The injury is characterized pathologically as chronic bronchitis and bronchiolitis. In this disease the terminal airways of the lungs of the animals were thickened, the air passages narrcwed, with fibrotic tissue response extending into surrounding areas of the lung and consequent emphysema, resulting in lessened capacity to move air in and out of the lungs. The dog showed none of the deep lung changes seen in the smaller animals but only mild irritation of the trachea and major bronchi. Man's relative positicn in this range of pulmonary response of ozone was judged to be between that of the dog and the smaller animals, on the basis of calculations involving dimensicns of the trachea, larger air

passages, and ventilation rates, and assuming equal cellular susceptibility of man and dog. Reference made to man's response to low-grade ozone exposures further substantiates this position. Statistical evidence is given that rigorous control of the exposure concentration was maintained at plus or minus 1.0 ppm by volume as determined by the alkaline potassium iodide method. (Author summary)##

03625

C. E. Throp

INFLUENCE OF NITROGEN OXIDES ON THE TOXICITY OF OZONE. J. Am. Chem. Soc. (News Ed.) 19(12):686-688, June 25, 1941.

This report points out a possible cause of discrepancy between investigators of the toxicity of ozone, shows how the source of ozone influences the toxicity, and illustrates with test data which have been obtained over a period of years in this laboratory. Tests on B. coli, weevils, and algae show a large difference of toxicity between pure ozone and ozone containing nitrogen oxides. The variance of opinion in the literature on ozone toxicity is probably due to results obtained with ozone containing varying amounts of nitrogen oxides. Ozone free of oxides of nitrogen is non-toxic in concentrations below 20 parts per million. Ozone plus nitrogen oxides may be more toxic than nitrogen oxides alone and should be investigated further. Ozone containing 47 percent nitrogen oxides has bactericidal properties in concentrations over 3 parts per million, but pure ozone does not exhibit bactericidal properties below 50 parts per million.##

03708

S. G. Burgess, and C. W. Shaddick

BRONCHITIS AND AIR POLLUTION. Roy. Soc. Health J. 1, 10-24, 1959. (Presented at a Sessional Meeting, London, England, Oct. 23, 1958.)

Considerable care and attention to details of standardization are necessary to obtain records of atmospheric pollution sufficiently consistent in accuracy to be useful to correlate with mortality figures. The figures obtained, which are restricted to smoke and acidic gases (mainly SO2), show that smoke in the air of London has decreased over the last 4 years, but the concentration of acidic gases has remained fairly consistent. This result accords with a decreased consumption of coal by residential and, to a lesser extent, industrial and commercial users, but an overall fuel consumption that has remained relatively constant. There is little doubt that living in London for a long period increases the risk of dying from respiratory disease, particularly bronchitis: furthermore, since these diseases are often suffered over a number of years, morbidity too is associated with the length of residence. It must, however, be remembered that the index used - percentage born in London - is somewhat crude and gives no indication of internal movement. A

significant relationship between mortality and the two types of atmospheric pollution measured - smoke and "sulphur dioxide" has not been demonstrated, though the former looks the more dangerous. This does not preclude there being a critical level of one or both in combination that would be directly associated with increased mortality or morbidity, but equally there may be other types of pollutant more dangerous than either. In the short-term, whilst it is difficult to disentangle the effects of duration and intensity of atmospheric pollution and temperature from any seasonal trend, the threshold level above which a smog incident is likely to occur in London is when the mean level for London attains a daily value of 200 milligrams of black suspended matter per 100 cubic metres of air and 40 parts of "sulphur dioxide" per 100 million parts of air, i.e., about four times the customary winter level. When such a level is reached its proportionate effect is most marked on bronchitis, but there is as yet insufficient evidence to say which of the two pollutants measured, or even which component of the sukphur dioxide group, has the greater effect. (Author summary and conclusions)##

03723

V. A. Gordieyeff

SOME PROPERTIES OF UNIPOLARLY CHARGED AEROSOLS (A REVIEW). A.M.A. Arch. Ind. Health 14, (5) 471-81, Nov. 1965.

The nature of atmospheric ions is discussed. Methods are presented for electrically charging liquid mists and dust. The practical therapeutic applications of unipolarly charged aerosols are indicated. The major significant effect of inhalation of unipolarly charged aerosols was the lowering of blood pressure.##

03726

A. P. Krueger, P. C. Andriese, S. Kotaka

THE EFFECTS OF INHALING NON-IONIZED OR POSITIVELY IONIZED AIR CONTAINING 2-4% CO2 ON THE BLOOD LEVELS OF 5-HYDROXYTRYPTAMINE IN MICE. Intern. J. Biometeorol. 10, (1) 17-28, 1966.

It has been previously reported that the inhalation of positively ionized air by mice produced a characteristic rise in 5-hydroxytryptamine-(serotonin) blood levels (5-HT). This effect was duplicated when CO2 was supplied as the sole ionic component of the ambient atmosphere and was not produced by CO2 minus, O2 plus, or O2 minus. It was concluded that at least some of the inimical physiological effects of positively ionized air described in earlier papers depend upon the ability of CO2 cluster ions either to release 5-HT from the bound form or to inhibit its destruction by monamine oxidase. In the experiments reported here the conditions existing aboard submarines during long underwater patrols were approximated to the extent of providing an atmosphere containing more than the

normal concentration of CO2 found in outside air. Mice were maintained in atmospheres of 2% or 4% CO2 and in identical atmospheres subjected to positive ionization. Their reaction was evaluated in terms of the changes produced in 5-HT.##

03785

E. L. Gasteiger and S. A. Helling

X-RAY DETECTION BY THE OLFACTORY SYSTEM: OZONE AS A MASKING ODORANT. Science 154, (3752) 1038-41, Nov. 25, 1966.

The technique of masking was used to test the hypothesis that x-ray detection is mediated by an odorant produced in irradiated air. Rats conditioned to cease licking during exposure to x-ray (conditioned suppression) did not display this conditioned response in the presence of ozone and strong volatile oxidants.##

03791

CHRONIC BRONCHITIS - THE ENGLISH DISEASE. Pfizer Ltd., Kent, England. 1959. 72 pp.

Monograph outlines the problem of chronic bronchitis. The origin of the disease, factors which encourage its development, ways in which the disease progresses, and the final state of the patient are the salient points of discussion. Statistics on mortality and morbidity, socio-economic factors, and a discussion of the relationship between air pollution, fog, and chronic bronchitis also are included. Information is provided on the management of the disease and the role of drugs in its treatment.

03812

MacEwen, J. D.

CONTAMINANT GENERATION METHODS AND TECHNIQUES. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB Ohio, Contract AF 33 (657)-11305, Proj. 6302, AMRL-TR-65-230, p. 18-26, Nov. 1965. 12 refs.
CFSTI, DDC: AD 6929622

The contaminant generation methods used in the Toxic Hazards Research Unit (THRU) laboratory are described. The entire contaminant generation system used is made of corrosion resistant stainless steel. Generation techniques for gases, liquids, dusts, gas-off mixtures, and nominal contaminant concentrations are discussed. Some of the difficulties encountered which require modifications of standard equipment for successful contaminant generation to produce uniform animal exposures in experimental chambers are pointed out. The concept followed in the production of chamber concentrations at reduced pressure has been described in detail.##

03813

Vernot, E. H.

ANALYTICAL CONTROL OF CONTAMINANT CONCENTRATION IN EXPOSURE CHAMBERS. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB Ohio, Contract AF 33(657)-11305, Proj. 6302. AMRL-TR-65-230, p. 27-33, Nov. 1965. 4 refs.
CFSTI, DDC: AD 629622

Methods used at the Toxic Hazards Research laboratory in the control of low concentrations of contaminants introduced into exposure chambers of various sizes are outlined. For ozone the method consists of pumping through a glass sampling tube or tonometer, and isolation of the sample after sufficient pumping for equilibration. The tonometer has a sidearm which can be capped for sub-sampling by syringes or which may be used for the addition of reagent solution. This method of sampling has proved superior to fritted bubblers. For nitrogen dioxide, the Saltzman method is used. For carbon tetrachloride, gas chromatography is used. Analytical techniques described require relatively simple operations which a technician can carry out with ease and precision. With this system, satisfactory control was maintained over contaminant concentrations in exposure chambers.##

C3820

McNerney, J. M.

PRELIMINARY RESULTS OF TOXICITY STUDIES IN 5 PSIA 100% OXYGEN ENVIRONMENT. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), b8wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 98-123, Nov. 1965.
CFSTI, DDC: AD 629622

A 90-day continuous exposure of mice, rats, beagles and monkeys to a 5 pounds per square inch absolute and 100% oxygen environment produced the following pertinent results: A Wistar-derived strain of rats proved to be sensitive to altitude conditions early in the exposure (15% mortality within 14 days of exposure) whereas a Sprague-Dawley-derived strain proved resistant. A possible association of increasing serum glutamic pyruvic transaminase levels in beagles with length of exposure was found. Except for these factors, the experimental animals gave no apparent indication of being stressed throughout the expsoure. A one-year study has been initiated to determine if the enxyme change was due to sampling or is indicative of an accumulating stress. No significant increase in the toxic response of animals to inhaled atmospheric contaminants (carbon tetrachloride, nitrogen dioxide, and ozone) under conditions of 5 psia and 100% oxygen was noted when compared with animals exposed under normal atmospheric conditions (except in the case of mice exposed to carbon

tetrachloride). Based upon mortality data, a definite reduction in toxic response to pulmonary irritants was found in the presence of reduced pressure (5 psia) and 100% oxygen when compared with ambient pressure at the same concentration for two weeks continuous exposure. This difference in toxic response may be a beneficial effect derived from the increased partial pressure of oxygen in the experimental chambers even though total pressure has been reduced. Specifically, this is an increase in oxygen partial pressure from approximately 150 millimeters Hg pO2 to 255 millimeters Hg pO2. This increase in oxygen tension at the pulmonary surface may be acting therapeutically against the pulmonary edema produced by the lung irritatns, ozone and nitrogen dioxide. In the case of carbon tetrachloride, a systemic toxicant, no such benefits were observable.##

03821

Back, K. C.

REVIEW OF AIR FORCE DATA FROM LONG TERM CONTINUOUS EXPOSURE AT AMBIENT PRESSURE. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 124-133, Nov. 1965.
CFSTI, DDC: AD 629622

Work which was performed under Air Force sponsorship in the area of environmental toxicology of space cabin atmospheres over the past 5 years is described. This work gave the warning that materials in trace quantities could prove toxic when presented to animals over long continuous exposure periods. Four exposure chambers were constructed for this work. This permitted use of one for a control group of animals and three for contaminant exposure chambers. All animals were followed by a number of clinical laboratory examinations before, during and following the 90-day exposure, and the animals were terminally given stress tests and then necropsied with both gross and microscopic examination of tissues. Carbon tetrachloride, while not causing death at 25 ppm, did cause serious clinical and microscopic liver changes in all animals exposed. The livers of the rats were so much involved that the patholcgist made a diagnosis of "cirrhosis". Phenol caused absolutely no problems whatsoever at the 5 ppm level Hydrogen sulfide (20 ppm) did produce death in rats and mice, but none in monkeys. Methyl mercaptan (50 ppm) caused serious problems and death in 40% of the monkeys and 43% of the mice. Tests were conducted to find out whether animals could perform strenuous tasks following the 90-day exposure and to compare the long term, continuous toxicity of some propellants and propellant types in which the Air Force has an interest. Hydrazine, unsymmetrical dimethyl hydrazine, nitrogen dioxide and decaborane were tested as candidate materials. The results are discussed.##

03822

Siegel, J.

REVIEW OF AMBIENT PRESSURE ANIMAL EXPOSURE DATA FROM SELECTED NAVY COMPOUNDS. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB, Ohio, b8contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 134-147, Nov. 1965.
CFSTI, DDC: AD 629622

Studies have been oriented toward operational requirements in a resolution of existing or anticipated problems, although basic research aspects are included in the Navy mission. For example, there was, and still is, a constant need to search for better methods of contaminant generaticns, for more reliable methods of analysis and monitoring, for new bio-chemical predictors, and for new ways of getting more informaticn from the exposed animal. Some chamber modifications, animals used, parameters studied, and classes of materials studied are discussed. Experimental results and plans for the future for the Navy Toxicology Unit are summarized.##

03823

Hueter, F. G.

LONG TERM INHALATION EXPOSURE EXPERIENCE WITH REFERENCE TO AIR POLLUTION. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965. Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 148-165, Nov. 1965.
CFSTI, DDC: AD 629622

As part of the overall program by the Division of Air Pollution the Laboratory of Medical and Biological b8sciences has been charged with studying the biological effects of plants and animals, including man, of chronic exposures, long term exposures to air pollution as it exists in the ambient atmosphere of communities. The concentration has been on mixtures of normal air pollution, not single agents or simple mixtures of pure gases. The initial studies discussed primarily are concerned with chronic exposure to auto exhaust-contaminated atmospheres, both raw auto exhaust as it comes from the tail pipe, as well as irradiated auto exhaust which simulates the photochemistry that occurs due to sunlight. The results with laboratory animals are discussed.##

03853

R. Ehrlich

EFFECT OF NITROGEN DIOXIDE ON RESISTANCE TO RESPIRATORY INFECTION. Bacteriol. Rev. 30, (3) 604-14, Sept. 1966

The effects of acute and chronic exposures to nitrogen dioxide, one of the most abundant atmospheric contaminants in many communities, on the resistance to infection produced by respiratory challenge with airborne Klebsiella pneumoniae is discussed. The reduction in the resistance to infection by a synergistic effect provides a sensitive indicator of the biological effects of nitrogen dioxide. A single 2-hr exposure of inbred mice to 3.5 ppm of NO2 before or after respiratory challenge with aerosol of K. pneumoniae significantly increases the mortality. The same effect produced in squirrel monkeys and hamsters required 35 ppm for 2 hr. The effect of a single 2-hr. exposure was not persistent and a return to normal resistance to infection occurred in 24 hr after the NO2 exposure. Exploratory studies of the mechanism of the increased susceptibility to infection suggests that the NO2 permits better colonization in the lungs of mice and hamsters. Extrapolation of this work to man or to the resistance to other species of pathogenic organisms can be only speculative.##

03883

E. A. Schuck and G. J. Doyle

A STUDY OF IRRADIATED AUTO EXHAUST. Stanford Research Inst., South Pasadena, Calif., Southern California Labs. (Rept. 9 and Technical Rept. 11.) Feb. 1958. 65 pp.

Aerosol was formed by irradiation of exhaust-air mixtures. The aerosol thus formed was in the submicron size region but was of sufficient concentration to reduce visibility appreciably--in some instances from around 40 miles down to 2 or 3 miles. The severity of eye irritation is dependent on the concentrations of hydrocarbons and nitrogen oxides. More particularly, a relationship has been established between the concentration ratio of hydrocarbons and oxides of nitrogen and the degrees of eye irritation, the degree of irritation being dependent on the concentration ratio. This ratio also influences the rate of formation of the aerosol, oxidant, and indicated nitrogen dioxide. Varying the relative humidity in the exhaust-air mixtures between 40% and 80% and the temperature between 26 C and 40 C had no detecta le effect on any of the measured symptoms. Eye irritation increased as the light intensity was increased from zero to 3/4 the intensity of noonday sunlight, but did not appear to increase with a further increase in intensity up to about twice that of noonday sunlight. Eye irritation intensity was found to be a function of residence time under irradiation. The results indicate that the length of time that pollutants reside under irradiation has an effect on the severity of smog symptoms, i.e., leads to an increase and then a decrease in eye irritation with time. The smog potential from an auto exhaust mixture appears to be intimately associated with hydrocarbon concentration, oxides of nitrogen concentration, the concentration ratio of hydrocarbons to oxides of nitrogen, light intensity, and residence time under irradiation. The half life of the eye irritant produced by irradiating dilute auto exhaust was determined to be in the order of 24 hr, indicating the presence of a rather stable irritant. The half life of the

aerosol was found to be 12 hr, and that of the oxidant or indicated nitrogen dioxide was less than one hour. Thus, from the measure of half life, the aerosol, oxidant, and indicated nitrogen dioxide do not appear to be intimately associated with eye irritation.##

03890

C. H. Hine, F. H. Meyers, F. Ivanhce, S. Walker, and G. H. Takahashi

SIMPLE TESTS OF RESPIRATORY FUNCTION AND STUDY OF SENSORY RESPONSE IN HUMAN SUBJECTS EXPOSED TO RESPIRATORY TRACT IRRITANTS. Proc. Symp. Human Exposures tc Air Pollutants, Fifth Air Pollution Medical Research Conf., Los Angeles, Calif., Dec. 4, 1961. pp. 20-38.

This report summarizes two basic studies regarded by the investigators as necessary antecedents tc the orderly development of research in chronic obstructive ventilatory disease. One study evaluated the degree of sensory responses and the threshcld of detection for several agents. The sensory responses in this study were carried out primarily tc determine whether changes in respiratory function would be achieved at levels at which there was no significant sensory response tc irritant gases.##

03978

S. W. Nicksic, J. Harkins, L. J. Painter

STATISTICAL SURVEY OF DATA RELATING TO HYDROCARBON AND OXIDES OF NITROGEN RELATIONSHIPS IN PHOTOCHEMICAL SMOG. Intern. J. Air Water Pollution 10, (1) 15-23, Jan. 1966.

Results from various photochemical irradiation chamber experiments were examined by statistical procedures to determine the effect of hydrocarbon and oxides of nitrcgen concentrations on eye irritation. The regression equations are given together with graphs drawn frcm these equations. Some aspects of the practical interpretation of the results are discussed. Data on existing ambient concentraticns of hydrocarbon and oxides of nitrogen in the Los Angeles atmosphere are compiled. (Author abstract)##

04031

W. D. Chiles, J. M. Cleveland, and R. E. Fox

A STUDY OF THE EFFECTS OF IONIZED AIR ON BEHAVIOR. Physics, Engineering, Chemistry Corp., Boulder, Colo. (WADD Technical Rept. 60-598.) Nov. 1960. 24 pp.

The effect on human behavior of an atmosphere containing excesses of unipolar ions was investigated. Fifteen subjects were tested

on a complex metal task, an additional fifteen performed a vigilance task, and twenty subjects indicated their attitudes through marking an adjective check list while exposed to five levels of air ionization. The ion conditions for each study were varied from a high excess of positive ions through a medium excess of positive ions, low ion (netural), medium negative, and low negative. None of the differences found among the ion conditions for these tests were statistically significant. (Author abstract)##

04048

J. R. Dixon, J. T. Mountain, and H. E. Stokinger

ROLE OF HISTAMINE AND RELATED SUBSTANCES IN TOLERANCE TO EDEMAGENIC AGENTS. Preprint. (Presented at the Third Annual Meeting, Society of Toxicology, Williamsburg, Va., Mar. 11, 1964.)

To determine whether histamine plays a significant role in tolerance development of mice to normally lethal doses of ozone, the following were investigated: (1) Release of histamine from lung by tolerance doses of ozone; (2) The duration of the depression of lung histamine content; (3) Whether induction of lung histamine release by the drug 48/80 would induce tolerance; and (4) Whether tolerence development could be blocked by anti-histaminic drugs. In addition, it was decided to determine whether aspirin alone or in combination with the anti-histamine promethazine hydrochloride (Phenergan) could be employed to block tolerance induction by slight ozone exposure, or reduce edema or lethality caused by severe ozone exposure. Administration of the histamine-release drug 48/80 lowered histamine content of mouse lung for 24 hours, whereas mild exposure of mice to ozone had depressed lung histamine for up to 25 days. Phenergan and aspirin administered together during a mild exposure to ozone were partially effective in blocking development of tolerance to ozone; the drugs given singly under identical conditions had no effect on tolerance development. Edemagenic, sub-lethal, expcsures tc ozone were mitigated by drug treatment prior to exposure. It was concluded that the edema response in mice exposed to ozone may be mediated, in part, by the action of histamine and related substances such as kinins and slow-reacting substance-A. Reasons are advanced for proposing that sulfhydryl systems and cofactors related to the glucose monophosphate pathway are involved. (Author summary modified)##

04054

F. L. Petrilli and G. Agnese

THE ROLE OF EPIDEMIOLOGICAL STUDIES IN THE DEVELOPMENT OF AIR QUALITY STANDARDS. Le Role des Etudes Epidemiolcgiques dans le Development des Jugements de la Qualite de L'air. Preprint. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963.) Fr.

The problems involved in epidemiological studies of air pollution are reviewed, particularly with regard to mortality and morbidity studies. In the case of mortality due to all causes, the correlation of mortality statistics with smog (London and elsewhere) incidence, makes a mortality curve a veritable smog register. The attempt to establish a correlation between air pollution and mortality due to respiratory disease is complicated by the lack of precise diagnostic criteria, as in the case of bronchitis which may have different connotations in England and Italy, for instance. From the authors' investigation of lung cancer mortality in Italy, the following statistical data were derived: (1) approx. 85% of the lung cancer deaths are due to cigarette smoking; (2) approx. 10-15% of lung cancer deaths are due to vehicular emissions; (3) approx. 10% of the lung cancer deaths are due to occupational hazards. In regard to morbidity studies, it was believed that the most sensitive groups of the population, the aged and children, were the most desirable subjects. Studies of children made in the city of Genes took into consideration the incidence of grippe, tonsillitis and bronchitis of school children living in two different zones of the city, one having more air pollution than the other. Those from the more air polluted area showed greater incidence of bronchitis. Studies of 722 female inhabitants of Genes of over 64 years of age living in four very differently polluted areas (SO2 and suspended particulate data are given) confirmed that there is a correlation between respiratory ailment frequency and air pollution incidence. It is concluded that although there is no precise means of deducing the quality of air from epidemiological observations, the indications and complexities of the problem are evident.##

04205

G. L. Freeman

WHEEZING ASSOCIATED WITH RESPIRATORY TRACT INFECTIONS IN CHILDREN (THE ROLE OF SPECIFIC INFECTIOUS AGENTS IN ALLERGIC RESPIRATORY MANIFESTATIONS). Clin. Pediatr. 5, (10) 586-92, Oct. 1966.

The known relationships of common acute bacterial and viral respiratory infections to the asthmatic state and to wheezing attacks in children are reviewed. The associations of some of the more important respiratory pathogens of childhood with asthma or wheezing are summarized. The treatment includes the use of antibiotics for the few respiratory infections of definite bacterial origin. Bacterial vaccines are of unproven value. Gamma globulin does not help young asthmatics who wheeze. Use of corticosteroids is reserved for acute asthmatic attacks, and they are given under antibiotic coverage. Obvious exposure to upper respiratory illness should be avoided. Specific prevention and treatment of attacks depends on the use of multi-agent viral vaccines and antiviral agents. Consideration should be given to the long term effect on the child who receives an increasing variety and volume of material by injection and ingestion. Hyperimmunization might have an adverse effect after a number of years.##

04208

H. L. Motley and F. Yanda

ENVIRONMENTAL AIR POLLUTION, EMPHYSEMA, AND IONIZED AIR.
Diseases Chest 50, (4) 343-52, Oct. 1966.

The aim of the original work was to determine if there is any basis for the use of commercial generators in treating chronic pulmonary disease and, if so, what the indications are. Small negative and positive ions (velocity 1-2 cm./sec./volt/cm.) were measured with the Beckman micro-micro-ammeter and Wesix ion collector. Tubin and RCA ion generators were used. Ion densities of approximately 500,000 ions per ml. were delivered at the level of the nose of the subject. The ion generators were mounted above the patient's face and the ions allowed to drift down like a cloud. The patients were grounded. No significant changes in lung volume measurements were observed in severe emphysema and or fibrosis patients after breathing negative ions (500,000 ions per ml.) in one study of 13 cases for one hour, and in a second study of 33 cases after three hours. No significant differences were observed in lung volume measurements obtained on 19 cases of severe pulmonary emphysema before and after breathing negative ions (500,000 ions per ml.) at home seven to 12 hours a day for two weeks; also the data were no different from those obtained on seven controls studied in a similar fashion except for the ions. Some of the patients reported subjective improvement. However, the subjective sensations were not borne out by changes in the pulmonary function tests employed in this study, as there was no correlation. No significant changes in blood gas exchange measurements were observed in 44 cases of severe emphysema and/or fibrosis after breathing negative ions (500,000 ions per ml.) for 30 minutes. Previous studies revealed no significant change occurred in 35 cases of chronic pulmonary disease after breathing positive ions (500,000 ions per ml.) for 30 minutes. It was felt that there is no good evidence to recommend the use of air ions, either negative or positive, in the treatment of chronic pulmonary diseases in man. The evidence of air pollution and cigarette smoking as factors in some people developing pulmonary emphysema is also reviewed.##

04221

V. P. Paribok and F. A. Ivanova

AIR TEMPERATURES AND THE TOXIC EFFECTS OF NITROGEN OXIDES.
Fed. Proc. (Transl. Suppl.) 25, (5) (Part II) T851-3,
Oct. 1960. Russ. (Tr.) (Gigiena Truda i
Professional'nye Zabolevaniya (Moscow) 9, (7) 22-4, 1965.)

The influence of temperature on the toxicity of the nitrogen oxides to mice is reported. The nitrogen oxides were produced by the action of nitric acid on copper and the proportions of NO and NO2 were estimated. The mice were exposed to various concentrations of nitrogen oxides over the temperature range 10 to 35 degrees C in desiccators. The toxic effects were least

at 15 degrees C. There was less methemoglobin in the blood at high temperatures. The toxic effects of the nitrogen oxides are greater at high temperatures because of the disturbance of heat regulation and reduced oxygen consumption. At low temperatures the toxic effects are increased by increased methemoglobin formation and the disturbance of heat regulation.**

04317

Goldstein, Bernard D. and Oscar J. Balchum

EFFECT OF OZONE ON LIPID PEROXIDATION IN THE RED BLOOD CELL. Proc. Soc. Exp. Biol. Med., Vol. 126, p. 356-358, 1967. 12 refs.

A study was made concerning the possibility that the deleterious biological effects of ozone are mediated by lipid peroxidation caused by the interaction of ozone with the double bonds of unsaturated fatty acids. To investigate this hypothesis, an in vitro system employing human erythrocytes as a target organ was utilized in preference to animal lungs, because of the difficulty in comparing control non-exposed lungs with exposed lungs heavily infiltrated with peripheral leukocytes. Erythrocyte osmotic fragility was measured as an indication of spherocyte formation. Erythrocyte fragmentation may be due to direct membrane damage, short of overt hemolysis, for which the normal reparative cell process cannot compensate; or, to interference with the intracellular metabolic processes necessary for membrane integrity. The increase in TBA reacting substances suggests that the former mechanism is operative with peroxidation of unsaturated fatty acids contained in the cell membrane and the formation of free radicals perhaps causing damage to neighboring protein. However, interference with biochemical pathways necessary for the maintenance of the cell membrane cannot be excluded. It is speculated that the hypothesized involvement of lipid peroxidation in the aging process is related to the frequent observation of generalized aging in animals chronically exposed to ozone. A further speculation is that if emphysema be considered a normal aging change, the increase in chronic respiratory disease in areas of urban air pollution found in epidemiologic studies is due to the acceleration of aging in the lung by air pollutant-induced lipid peroxidation.**

04321

I. S. Jaffe

THE NATURE AND EFFECTS OF PHOTOCHEMICAL AIR POLLUTANTS ON MAN AND ANIMALS. I. GENERAL CHARACTERISTICS AND COMMUNITY CONCENTRATIONS. Preprint. 1967.

Photochemical smog consists of mixtures of gaseous and particulate products resulting from atmospheric photochemical reactions of gases evolved from the combustion of organic fuels for heat and power. Ultraviolet radiation from sunlight initiates a series of atmospheric reactions between the oxides of nitrogen

and photochemically reactive organic substances, such as the olefins, aromatic hydrocarbons and effluents. The photochemical oxidants are a major class of compounds found in community photochemically polluted air. They consist of a dynamic complex mixture of oxidizing substances which vary in time and place. Nonetheless, they can be measured routinely as "total oxidant", i.e., the net oxidizing effect of all substances in the atmosphere. Ozone and the peroxyacyl nitrates (PAN compounds or PaNs), a homologous group of organic peroxidic nitrogen compounds, have been identified as important oxidants formed in photochemical smog. Ambient "total oxidant" levels serve as useful practical indices of the intensity of photochemical smog and of various biological and physical manifestations of photochemical air pollution. The sources, characteristics and methods of measurement of the photochemical oxidants are described. Specific aerometric data on the oxidant concentrations found in various urban communities in the United States are provided. These levels are sufficiently high to cause specific adverse effects on man, animals, vegetation and certain materials (rubber and textiles). (Author abstract) ##

04322

Jaffe, L. S.

THE NATURE AND EFFECTS OF PHOTOCHEMICAL AIR POLLUTANTS ON MAN AND ANIMALS. II. ADVERSE EFFECTS OF PHOTOCHEMICAL SMOG ON MAN AND ANIMALS. Preprint. 1967.

When concentrations of photochemical oxidants are used as measures of photochemical smog intensity, a number of specific biological effects on man and animals based on both atmospheric and laboratory studies have been documented. Photochemical oxidants, such as routinely found in urban communities as measured by continuous air monitoring instruments used by Federal, State and local agencies, cause a repeated and continuing biological impact on man and animals in every region of the country. The degree and types of the documented biological effects are dependent on the local community atmospheric level attained and the frequency of occurrence. Concentration, ppm/pollutant, chemical method of measurement, exposure period and effects are presented in the following tables: (1) Effects of short-term exposures of photochemical oxidants on man and animal, and (2) effects of proponged exposures of photochemical oxidants on man and animal.##

04323

Jaffe, L. S.

THE BIOLOGICAL EFFECTS OF OZONE ON MAN AND ANIMALS. Preprint. Am. Ind. Hyg. Assoc. J. Vol. 8, 267-277p, June 1967.

The more recent literature on the physiologic and pathologic effects of various concentrations of ozone in short-term and prolonged exposures on man and animals is reviewed. Particular

emphasis is given to recent data on the effects of low concentrations of ozone (0.05 to 0.20 ppm). Such ozone concentrations are commonly encountered in community atmospheric photochemical or "Los Angeles-type" smog, in arc-welding operations, and under certain conditions in cabins of jet aircraft flying at high altitudes and in confined work spaces where high voltage electrical equipment and instruments are used. Adverse effects such as the irritation of the mucous membranes of the upper respiratory tract, a decrease invisual acuity and other changes in ocular parameters, an enhancement in mortality of respiratory infected test animals, the sphering of red blood cells, structural changes in the nuclei of myocardial tissue, and an increase in mortality of newborn animals have been reported within this range with the particular effect depending on the specific concentration and length of exposure. At higher concentrations such as those occurring during severe photochemical smog (0.06 to 0.08 ppm for two hours), ozone will interfere with lung function for the duration of exposure and beyond. Other effects of ozone on man and animals at various concentrations and exposure times such as distinct respiratory distress, coughing, choking and severe fatigue occur at concentrations at or below 1.0 ppm (the maximum level of ozone ever measured in dense atmospheric photochemical air pollution). (concentration, method of measurement, exposure period, and effect are presented in following tables: (1) Effects of short-term ozone exposures on man and animal, and (2) Effects of prolonged ozone exposures on man and animals. AAM##

04416

R. F. Bils

ULTRASTRUCTURAL ALTERATIONS OF ALVEOLAR TISSUE OF MICE (I. DUE TO HEAVY LOS ANGELES SMOG). Arch. Environ. Health 12, (6) 689-97, June 1966.

Three animal exposure stations have been in operation for 3 years in the Los Angeles area to ascertain the effects of smog on mice. During the course of this study alterations in the fine structure of the alveolar tissue have been observed. Control animals were kept in rooms with well filtered air. Similar groups were in other rooms continually breathed the ambient air. The lungs of groups of mice ranging from 2 to 21 months old were prepared for electron microscopy. Each particular "group" of animals represented at least four or five mice, and the results are illustrated in this report.##

04480

L. L. Vasil'yev

THEORY AND PRACTICE OF IONIZED-AIR THERAPY. Leningradskogo Gosudarstvennogo Universiteta imeni A.A. Zhdanova, Leningrad. (Rept. No. FTD-TT-65-590/1+2.) 1951. 142 pp. Russ. (Tr.)
DDC AD-630 415

The aim was to make the numerous special works on aeroionization readily accessible to the ordinary reader. The brochure is intended mainly for physicians and biologists, but may prove to be understandable and not without interest for every sufficiently educated reader. Moreover, an attempt has been made to present the factual and theoretical material on questions of aeroionization and aeroiontherapy, but also to teach as far as possible how to work experimentally in this promising area of knowledge. Parts of this paper are under the headings: (1) Natural Ionization of Air, its Climatological and Hygienic Significance, (2) Artificial Ionization of Air. Aeroion Generators and Counters, (3) Therapeutic Use of Aeroionization (Aeroiontherapy), (4) Experimental Bases of Aeroiontherapy and (5) Paths and Mechanisms of the Physiological Effect of Aeroions.##

04494

H. E. Stokinger

OZONE TOXICITY (A REVIEW OF THE LITERATURE THROUGH 1953). A.M.A. Arch. Ind. Hyg. Occupat. Med. 9, 366-83, May 1954.

The purpose of this review is to reevaluate research on the toxicity of ozone to determine wherein the difficulty lies in the opposing view-points and to present a clear picture of our knowledge on ozone toxicity. The review includes information on six aspects of ozone: 1. Preparation and properties of ozone. 2. Analytic procedures in common use. 3. Toxicity and physilogic responses in animals. 4. Physiologic effects in man. 5. Limited presentation on the effects of ozone on microorganisms and carbon monoxide. 6. Sources of human exposures. This review is concerned chiefly with the factual portions of scientific reports relating to ozone toxicity.##

04495

H. E. Stokinger, W. D. Wagner, P. G. Wright

STUDIES OF OZONE TOXICITY (I. POTENTIATING EFFECTS OF EXERCISE AND TOLERANCE DEVELOPMENT). A.M.A. Arch. Ind. Health 14, 158-62, Aug. 1956.

A striking enhancement of the toxicity of ozone has been demonstrated in rats and mice when they are exercised intermittently during exposure. Ozone concentrations of 1 ppm are fatal in 6 hours in these species when accompanied by exercise for 15 minutes each hour during exposure. A marked tolerance to ozone has also been developed in these species. The tolerance is rapidly developed (within 24 hours) and persists for 4 to 6 weeks, as shown by survival from challenging exposures of lethal magnitude or upon reexposure to multilethal doses of ozone and by the absence of characteristic pulmonary edema and hemmorrhage that regularly follow such exposures. (Author summary)##

04498

J. L. Svirbely, O. J. Dobrogorski, H. E. Stokinger

ENHANCED TOXICITY OF OZONE-HYDROGEN PEROXIDE MIXTURES. Am. Ind. Hyg. Assoc. J. 22, (1) 21-6, Feb. 1961.

Concern over enhanced toxicity of air pollutant mixtures has led to the experimental demonstration that hydrogen peroxide (H2O2) in concentrations of a few ppm killed animals after a brief exposure when inhaled with a nonlethal concentration (1 ppm) of ozone (O3). It was possible also to demonstrate a moderate degree of protection against otherwise lethal doses of H2O2, by a single prior exposure to H2O2. Moreover, cross tolerance against the organic peroxide, cumene hydroperoxide was afforded also by a prior exposure to H2O2. Particularly noteworthy, was a tolerance produced by a prior exposure to O3 to mixtures of H2O2 and O3, despite the fact that such mixtures normally show enhanced toxicity.##

04588

W. S. Spicer, Jr.

THE COMPLEXITY OF THE RELATIONSHIP BETWEEN AIR POLLUTION AND RESPIRATORY HEALTH. Proc. Natl. Conf. Air Pollution, Washington, D.C., 1962. pp. 126-36. 1963.

The research reported is based on actual studies. It represents one way of evaluating the relationship between air pollution and respiratory health. However, the results obtained have direct application to other methods of study now in use. The unraveling of the pressing problem of the relationship between air pollution and respiratory health will require the combined coordinate effort of many disciplines.##

04645

L. G. Wayne

EYE IRRITATION AS A BIOLOGICAL INDICATOR OF PHOTOCHEMICAL REACTIONS IN THE ATMOSPHERE. Atmos. Environ. 1, (2) 97-104, Mar. 1967. (Presented at the Symposium on Photochemical Aspects of Air Pollution, Cincinnati, Ohio, Apr. 1965.)

Studies involving the quantitation of eye irritation produced by experimental exposure of humans to synthetic atmospheres are discussed. The principal methods used are panel measurements of intensity, threshold, or response delay. Advantages and difficulties of each method are reviewed, as well as characteristics of the data generated and appropriate means of manipulating the data. Evidence regarding the possible chemical identity of irritants in photochemical smog is discussed, leading to the conclusion that not all observed eye irritation is accounted

for by additive effect of formaldehyde, acrolein, and peroxyacyl nitrates. Implications of the findings for air pollution control policies are considered. As one of the undesirable manifestations of photochemical smog, eye irritation has been the subject of a number of studies in recent years. This article reviews several of these studies with particular reference to those aspects relevant to air pollution research and air pollution control policy. (Author abstract)##

04650

F. L. Estes

THE EFFECT OF INITIAL CONCENTRATION OF REACTANTS ON THE BIOLOGICAL EFFECTIVENESS OF PHOTOCHEMICAL REACTION PRODUCTS. Atmos. Environ. 1, (2) 159-71, Mar. 1967.

Synthetic air pollution mixtures were produced by the irradiation of air containing nitrogen dioxide and butene-1 in an all-glass flowing system. The percentage of butene-1 consumed increased with the initial nitrogen dioxide concentration in the range of 2.3 to 4.5 ppm. Further increase in the nitrogen dioxide concentration led to less butene disappearance. After the first 40-60 min of irradiation, the amount of butene and of nitrogen dioxide which disappeared was constant. This observation, along with the small variations in oxidant analysis, suggested that photochemical products were not markedly changed with time. The amount of the reactants consumed and the inhibition of the subsequent growth of E.coli was a function of the initial ratio of the reactants. A butene-nitrogen dioxide ratio of 20 was most inhibiting. On doubling the concentration of the reactants, the inhibition factor doubled also. When the activity was determined with a glutamate substrate, the decrease in activity of glutamic dehydrogenase was linear with time of exposure of the enzyme. The activity of the enzyme was less inhibited in the reverse direction with an alpha-keto glutarate substrate. (Author abstract)##

04698

S. D. Murphy

MECHANISM OF THE EFFECT OF ACROLEIN ON RAT LIVER ENZYMES. Toxicol. Appl. Pharmocol. 7 (6) 833-43, Nov. 1965. (Presented in part at the Third Annual Meeting, Society of Toxicology, Williamsburg, Va., Mar. 9-11, 1964.)

Liver alkaline phosphatase and tyrosine-a-ketoglutarate transaminase activities were markedly increased in rats at 5-12 hours after injection or inhalation of acrolein. These effects could be prevented or substantially reduced by prior adrenalectomy or hypophysectomy or by pretreatment of the animals with chemicals which inhibit protein synthesis. The data suggest that the irritant action of acrolein stimulates the pituitary-adrenal system, leading to hypersecretion of glucocorticoids which act to induce or stimulate the sythesis of increased amounts of the enzyme proteins by the liver.##

04709

R. H. Pigdon and J. Neal

ABSORPTION AND EXCRETION OF BENZPYRENE OBSERVATIONS IN THE DUCK, CHICKEN, MOUSE AND DOG. Texas Rept. Biol. Med. 21, (2) 247-61, 1963. (Presented at the Annual Meeting, American Association for Cancer Research, Southwestern Section, New Orleans, La., Nov. 16-17, 1962.)

Large amounts of benzpyrene crystals and/or benzpyrene suspended in a physiologic solution of sodium chloride with a 1 per cent solution of polysorbate 80 have been given orally to ducks, chickens, mice and dogs and intratracheally to ducks with no noticeable acute injurious effect. Benzpyrene has been demonstrated spectrophotometrically in the blood and bile of the chickens and dogs and in the blood of the duck. The presence of this hydrocarbon in the blood and biles is influenced by the interval elapsing between the injecting of the benzpyrene and the time the sample was obtained. The skin of the chicken and mouse has a definite blue fluorescence with ultraviolet light following oral administration of benzpyrene. The mesentery, gallbladder, kidney and urine of the mice fluoresce. The kidney of the chicken and duck likewise fluoresces. Macroscopic observations of tissues with ultraviolet light and photography of the specimen may be helpful in the biological study of hydrocarbons. (Author summary)##

04738

A. A. Thomas

AEROSPACE TOXICOLOGICAL RESEARCH. Proc. NATO AGARD Conf. (Paris) (2) 259-78, Sept. 1965.

The major areas of aerospace toxicology such as propellant toxicology, environmental pollution, and space cabin environment are reviewed. Because of the short duration, high level, and infrequent exposures, the industrial Threshold Limit Values are meaningless. The philosophy of emergency exposure assumes that no one will be intentionally exposed to high concentrations of propellant vapors under ordinary conditions; if there is exposure, subjective and objective symptomatology may occur, but pathology should be reversible and the performance of the operator must not be impaired. Valuable information from the aerospace toxicological research projects include: exposure data that can be applied to community air pollution problems, new high-energy propellants which are potential pharmacological research tools, and a better understanding of the oxygen toxicity problem.##

04852

K. I. Campbell, G. L. Clarke, L. O. Emik, and R. L. Plata

ACUTE INHALATION TOXICITY OF THE ATMOSPHERIC CONTAMINANT PEROXYACETYL NITRATE TO MICE. Preprint. 1967.

The acute inhalation toxicity of peroxyacetyl nitrate (PAN), a photochemical air pollutant, was studied using A-strain mice. The median lethal concentration (LC50) based on 2-hour exposures at 80 F and mortality observed for 4 weeks was estimated at 106 ppm. Lethal potency of PAN appears to be approximately comparable tc that of NO2, greater than that of SO2 and less than that of O3. Exposures at concentrations near median lethal potency characteristically produced a delayed mortality pattern, most deaths occurring in the second and third week. Lethal toxicity was greater in older than in young mice, and at higher than at lower temperatures, but was not influenced appreciably by relative humidity.##

04964

S. N. Rokaw and F. Massey

AIR POLLUTION AND CHRONIC RESPIRATORY DISEASE. Am. Rev. Respirat. Diseases 86, (5) 703-4, Nov. 1962. (Presented at the Fifth California Air Pollution Medical Research Conference, Los Angeles, Dec. 4, 1961.)

This report summarizes 18 months of a longitudinal study of the effects of environmental variables cn pulmonary function in a relatively stable group of severely involved, chronic respiratory patients. Concurrently, a partial study of pulmonary responses to environment was made in subjects with no known respiratory impairments, selected from hospital personnel. The study was conducted at the Rancho Los Amigos Hospital, a chronic disease center for the County of Los Angeles. The data resulting from the studies of the patients and collected from the environmental monitoring equipment were validated and transmitted for biostatistical analysis at the Western Data Processing Center. Programing designed for the IBM 7090 was employed. Methods of combinatorial analysis and multiple regression were employed to detect relationships between the observed variations in pulmonary function test results and the conditions at the time of and during various periods preceding the time of testing, i.e., 24, 48, or 82 hours prior time blocks.##

04966L

AIR QUALITY CRITERIA FOR THE PHOTOCHEMICAL OXIDANTS. Public Health Service, Washington, D.C., Division of Air Pollution. Sept. 1966. 276 pp.

This document surveys published (and about to be published) scientific information on the occurrence of photochemical oxidants in polluted air and the effects of those oxidants on various receptors. On the basis of this survey, criteria are presented for the informational use of municipal, State, and interstate air pollution control agencies. The sources of the photochemical oxidants, methods of measurements, and typical atmospheric concentrations in various communities are described. Current information on the relationship between the photochemical oxidants and eye irritation and other effects on humans, various effects on animals and plants, effects on materials, and effects on visibility (haze formation) are summarized. This review includes results of both laboratory studies and ambient air exposure studies, and, for man, the results of industrial and experimental exposures and the findings of clinical and epidemiological studies. Tables summarize the reported effects of ambient photochemical smog. Supplemental data are provided to cover the effects of pure ozone or peroxyacyl nitrates--both important atmospheric photochemical oxidants--on plants, animals, and humans exposed in laboratory studies by various investigators. A bibliography at the end of the document lists the important references reviewed in its preparation. (Author introduction modified) ##

05116

W. F. Serat, F. E. Budinger, Jr., and P. K. Mueller

EVALUATION OF BIOLOGICAL EFFECTS OF AIR POLLUTANTS BY USE OF LUMINESCENT BACTERIA . J. Bacteriol. 90, (3) 832-3, Sept. 1665.

There is a need for an objective and rapid method for measuring and defining cytological damage caused by air pollutants. Bioluminescent bacteria fulfill well the requirements of a test subject in bioassay, insofar, as they are easily cultured, stable to normal experimental procedures, and produce a response light, the intensity of which can be measured with great sensitivity, Experiments were performed using two complete Pyrex glassware systems. One allowed closed circulation of irradiated gas mixtures over the bacterial cells on agar, and the other circulated a nonirradiated mixture. Neither clean ambient air nor irradiated synthetic air produced significant losses in luminescence of bacterial cells. On two separate occasions when visible air pollution was evident in the local atmosphere, ambient air was drawn over the cells, resulting in significant losses in luminescence. Thus, luminescent bacteria respond to toxicants in polluted air.##

05161

S. Miyata

THE INTERACTION BETWEEN ALBUMIN AND HEAVY METAL IONS. Japan J. Ind. Health (Tokyo) 2, (6) 49-55, June 1960. Jap.

EDTA and Ca-EDTA were found to have the ability to form stable complexes with Cd, Pb, and Mn stoichiometrically at pH 7.0 in a polarographic study of the interactions between albumin and heavy albumin and heavy metal ions. The effect of Ca-EDTA upon the combination of the metals with albumin was studied under various conditions for the purpose of clarifying the significance of CaEDTA as an accelerator of heavy-metal excretion. Cadmium combined with bovine serum albumin at the imidazol group, but this combination was inhibited by tris (hydroxymethyl)-aminomethane. The combination of plumbus ions with albumin was completely inhibited by tartaric ions. EDTA CaEDTA reacted also with the cadmium or lead combined with bovine serum albumin. (Author summary modified)##

05176

L. G. Wayne

THE CHEMISTRY OF URBAN ATMOSPHERES (TECHNICAL PROGRESS REPORT-VOLUME III). Los Angeles County Air Pollution District, Calif. Dec. 1962. 223 pp.

A major part of the research conducted by the Los Angeles County Air Pollution Control District has been concerned with the effects of fuel composition on smog, potencies of various compounds as precursors of eye irritation, identification and study of reaction products in photochemical systems, and plant bioassay of polluted atmospheres. These studies have been supplemented by research projects of other institutions. The objectives, methods, and findings of such recent research in smog chemistry comprise the subject matter of the following chapters. The status of research dealing with eye irritation as a manifestation of photochemical smog, including some discussion of the biometric concepts involved in the measurement of eye irritation are discussed in Chapter 2. Various suggestions as to the chemical identity of the eye irritants are critically considered. Harmful effects of smog on plants are discussed in Chapter 3. Participation of various primary and secondary contaminants in the photochemical reactions in smog is studied in Chapter 4. Detailed consideration is given to the light-absorbing characteristics of primary pollutants and the chemical consequences of light absorption. Evidence about the development of photochemical products as secondary pollutants is critically reviewed, with special attention to the role and identity of a unique class of compounds, first discovered in the course of smog research, known originally as "Compound X". A reaction catalogue has been compiled (Chapter 5) listing the elementary reactions known or suspected to be important in the development of photochemical smog. The experimental evidence regarding the importance of airborne particulate matter in the chemistry of air pollution is reviewed in Chapter 6.##

05203

W. McDermott

AIR POLLUTION AND PUBLIC HEALTH. Sci. Am. 205, 49-57, Oct. 1961.

Air pollution as it affects human health is discussed in broad terms. Incomplete combustion is regarded as the major source of pollutants deleterious to man, and the automobile contribute heavily in this regard. Topography and geography combine to produce thermal inversions causing the formation of smog as seen particularly in Los Angeles. Research and epidemiological studies indicate a continually increasing connection between air pollution and respiratory disease, such as bronchitis and emphysema. The incidents which occurred at Donora and London showed conclusively that air pollution can have a profound effect on persons with a pre-existing respiratory ailment. It is suggested that a citizens' movement is required to provide the impetus necessary to minimize air pollution.##

05241

A. P. Krueger, S. Kotaka. and P. C. Andriese

SOME OBSERVATIONS ON THE PHYSICIOGICAL EFFECTS OF GASEOUS IONS. Intern. J. Biometeorol. 6, (1) 33-48, 1962.

This paper reviews some of the evidence pertaining to the biological effects of gaseous ions. Experimental data now available warrant the conclusion that reproducible biological effects occur in a variety of living forms including microorganisms, higher plants, insects, animals and man. The responses generally are limited in extent and to indict air ions as their sole cause requires great care in defining the experimental conditions. Some progress has been made in detecting the fundamental biochemical reactions associated with ion-induced physiological changes. The ready availability of excellent apparatus for generation and measurement of air-ions, coupled with present-day knowledge about their properties, makes critical experimentation possible. e8Author abstract modified)

05294

05294

C. H. Pan, J. H. Gast, and F. L. Estes

A COMPARATIVE PROCEDURE FOR EVALUATING ANTIMICROBIAL ACTIVITY OF GASEOUS AGENTS . Appl. Microbiol. 9, (1) 45-54, Jan. 1961. (Presented at the 59th General Meeting, Society of American Bacteriologists, St. Louis, Mo., May 1959.)

A dynamic method for comparison of the antimicrobial activities of gaseous agents is proposed. Specially designed apparatuses for multiple exposure and growth of organisms are described and the validity of the method is discussed. Three gases, ethylene oxide, methyl bromide, and formaldehyde, and five bacteria, Escherichia coli, Bacillus cereus, Bacillus megaterium, Bacillus licheniformis, and Staphylococcus aureus, were tested and compared ; typical data are presented to demonstrate the results. Application of this dynamic method for the investigation of the mechanism of action of gas sterilization is suggested.##

05295

D. M. Pace, J. R. Thompson, B. T. Aftonomos, and H. G. C. Holck

THE EFFECTS OF NO2 AND SALTS OF NO2 UPON ESTABLISHED CELL LINES . Can J. Biochem. Physiol. (Ottawa) 39, 1247-55, 1961.

The effects of several concentrations of 'NO2, NaNO3, and NaNO2 respectively, upon strain L, mouse liver cells, and HeLa cells, were studied and a modified system designed to permit continuous exposure of cells to air pollutants is described. In NCTC medium 109 containing serum, cells tolerate concentrations of NO2 up to 4100 p.p.m. and some may even tolerate 8600 p.p.m. Removal of the serum lowers the lethal concentration of NO2 to less than 100 p.p.m. If the cells were covered only by a thin film of BSS (balanced salt solution) medium, a concentration of 100 p.p.m. NO2 proved toxic within 1/2 hour. If, however, the NO2 concentration was reduced to 5 or 10 p.p.m., cells survided a daily 8-hour exposure but many, if not most, of the cells were dead after several days. The presence of as little as 25 mg% NaNO2 retarded proliferation. On the other hand, NaNO3 was tolerated well in the three cell lines tested; HeLa cells seemed to be the most sensitive of the cell strains with respect to these salts. (Author abstract)##

05297

J. Pemberton

AIR POLLUTION AS A POSSIBLE CAUSE OF BRONCHITIS AND LUNG CANCER. J. Hyg., Epidemiol., Microbiol., Immunol. (Prague) 5, 189-94 (1961). (Presented at the International Epidemiological Symposium, Prague, Feb. 1960.)

Britain has the highest death rate from bronchitis in the world and the second highest death rate from carcinoma of the lung. Most of the population is also exposed to higher average levels of air pollution than anywhere else in the wrold. Work done in Sheffield, England, and in Belfast, Northern Ireland suggests that a high level of air pollution may be one of the causes of our high bronchitis and lung cancer death rates. Sheffield is an industrial city of half a million people whose chief industries are steel making, cutlery and tool making. Stations measured the amount of dark smoke and the amount of acid gas (mainly Sulphur Dioxe) in a metered volume of air per day. The average concentration of smoke in mg. per 100 cu.m. of air and of sulphur dioxide in parts per 100 million of air during the 24 hour period was thus available. Pollution levels on the time scale, by day, month or season and also difference occurring in various parts of the city at the same time were obtained. The number of deaths occurring each day in Sheffield from bronchitis and lung cancer was one of the indices used. However, there are only one or two deaths each day from these diseases in a city of this size and so this index is very insensitive in trying to estimate the immediate

effects of a sudden increase in air pollution. In a very large city the daily deaths from bronchitis may be obviously increased as they were in London after the great four day smog of December 1952 when the weekly deaths ascribed to bronchitis went up from 74 in the week preceding the smog to 704 in the week of the smog. It was known that men who already have chrnoic bronchitis are often made worse when the level of pollution increases suddenly. It was found that on two occasions when there was a sudden rise in the pollution level that there was a marked increase in the number of men with bronchitis who became more ill. The third index used was the number of men with new attacks of bronchitis each day. Also the annual incidence of deaths from bronchitis and from lung cancer in different wards of Sheffield and of Belfast in relation to mean pollution levels was studied. The fact that bronchitis and lung cancer are commoner in the more polluted parts of some cities does not of course establish that air pollution is a cause of these diseases. There are other conditions associated with high levels of air pollution such as low income and overcrowding and these may be the real causes. When the method of partial correlation was applied to a much larger amount of data from 28 big towns however, the positive correlation that remained (at the 1 percent level) were: 1. Lung cancer mortality and smoke pollution; 2. Lung cancer mortality and persons per acre; and 3. Bronchitis mortality and smoke pollution. To sum up, the observations and the publications of other workers strongly suggest that air pollution is one of the causes of death from bronchitis and of exacerbations of it. Air pollution may also be one of the causes of lung cancer although the evidence for this is not conclusive.

05364

H. T. Freebairn

THE TOXICITY OF OZONE, A CONSTITUENT OF "SMOG". J. Appl. Nutr. 12, (1) 2-13, 1959.

Ozone among other toxicants has been conclusively demonstrated to be present in abnormally high concentrations in the polluted atmospheres of a number of American cities. In Los Angeles, concentrations of ozone are present during repeated attacks of air pollution which, under controlled laboratory experiments, have been shown to affect animals and damage plants. These concentrations are presently at the border line of man's susceptibility and an increased concentration or duration of exposure to ozone in the Los Angeles atmosphere could cause injury to human beings. Ozone can be classified as a specific inhibitor and it possesses a "toxic activity" which indicates that it is more active than hydrogen cyanide as a poison. Ozone not only destroys the outer cell membranes of living organisms but also reversibly and irreversibly inhibits mitochondrial oxygen uptake. There is a suggestion that the reversible inhibition is enzymatic and that the natural resistance of a cell is related to the size of the metabolic pool of reducing substances capable of countering the oxidizing effects of ozone. (Author conclusion modified)##

05391

Saric, M.

OCCUPATIONAL EXPOSURE AS A FACTOR IN RESPIRATORY IMPAIRMENT. Arhiv. Hig. Rada Toksikol (Yugoslavia). 14, 327-60, 1963.

A review of the literature data on the effect of specific substances - common in industry as environmental pollutants - upon respiratory organs is presented. Included are such topics as respiratory diseases caused by gases, vapors and mist, the physiological action of irritating chemicals, and occupational lung cancer. Chronic bronchitis in industry is discussed separately, especially from the point of view of long-term effects of irritant gases and inert dust exposure. A part of the review relates to the diagnostic problems of bronchitis, as well as to the study of the so-called obstructive ventilatory diseases of the lung in relation to occupation.

05534

Amdur, M. O.

THE RESPIRATORY RESPONSE OF GUINEA PIGS TO HISTAMINE AEROSOL. Arch. Enviorn. Health 13, 29-37, July 1966.

The effect of histamine aerosols on the respiration of guinea pigs was measured. The response, which was graded with the level of histamine, consisted of an increase in pulmonary flow resistance, a decrease in compliance, tidal volume, and minute volume. The effect on respiratory frequency depended on both the concentration and the duration of exposure. Lower concentrations tended to increase the frequency while higher concentrations produced an initial increase followed by a decrease. The changes in respiration could be quite major and yet were very quickly reversed when the exposure terminated. The overall effect on respiration was qualitatively different from that observed in response to irritants such as sulfur dioxide, acetic acid, formaldehyde, or formic acid. The response to ozone is similar to that of low levels of histamine as is the response of animals with acute hypersensitivity when challenged with an aerosol of the protein to which they are sensitive. (Author summary)

05538

Coffin, D. L., Gardner, D. E., Holzman, R. S., and Wolock, F. J.

INFLUENCE OF OZONE ON PULMONARY CELLS. Arch. Environ. Health, 16(5):633-636, May 1968. 16 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-23.)

Previous studies have shown that exposure to ozone enhances the mortality from experimental infection and prolongs the survival of

bacteria within the lung. To determine the mediators of these phenomena, the composition and phagocytic activity of pulmonary cells were studied by lavaging the lungs of rabbits exposed to varying amounts of ozone. A marked influx of heterophilic leukocytes resulted from ozone exposure. This change was accompanied by a complementary decrease in percent of alveolar macrophages with no appreciable alteration in lymphocytes. When streptococci were instilled into the lungs of ozone exposed, anesthetized rabbits 30 minutes prior to lavage, a pronounced inhibition of phagocytic activity was noted. (Authors' abstract)

05584

P. Kotin and H. L. Falk

LOCAL AND SYSTEMIC RESPONSES TO EXPERIMENTAL EXPOSURE TO ATMOSPHERIC POLLUTANTS. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 141-9 (1955).

Rats, dogs, rabbits, and humans were exposed to artificially produced smog. The smog was first produced by exposing hydrocarbons to oxides of nitrogen in the presence of artificial or natural sunlight. This method was subsequently superseded by using gasoline and ozone. Exposure periods in most cases were short, being measured in hours rather than days. Pollutant concentrations were high, with concentrations being increased from ten to a hundred times those seen in naturally occurring polluted air. The first part of the report is concerned with studies on the acute and subacute responses and the second with the chronic, cumulative, prolonged, or carcinogenic responses. It is concluded that smog in naturally occurring concentrations produces no demonstrable physiologic or morphologic changes in presumably healthy animal species. Studies on humans, using 100 l plastic bags filled with smog, indicate that exposure to realistic concentrations produces negligible blood gas changes with minimal alterations in residual air. In contrast to the acute level, however, the data suggest that the atmosphere as a source of biologic morbidity is capable of being incriminated from a chronic or potentially carcinogenic viewpoint.##

05637

Hine, C. H. and Meyers, F. H.

THE HUMAN SUBJECT AND AIR POLLUTION RESEARCH. Preprint. (Presented at a Session of the Air Pollution Medical Research Conference on "Epidemiologic Studies of Obstructive Pulmonary Disease," Los Angeles, Calif., Dec. 4, 1961.)

In evaluating the possible effects of air pollution on the community, a variety of situations have been studied. Measurements have been made of meteorological, chemical and physical phenomena, the possible effects on vegetation, changes in morbidity, and behavior of domestic and laboratory animals. However, when it comes to a study of the effects of air pollutants on man, there is no experimental model which will substitute for a study of man

himself. A number of methods have been applied by investigators in studying man. These may be divided into two general approaches, epidemiological and individual. With regard to the former, it has been possible to gain some objective data relative to responses among select portions of the population, not necessarily confined to laboratory setting. Thus, it has been possible to study the individual in an ambulatory state, at his home or in special places of confinement, such as in hospitals and rest homes. This approach has the advantage of studying relatively large groups of subjects in their natural, or not too artificial, setting. It has the disadvantage of being difficult to regulate the environment to which they are exposed. Methods used in evaluating sensory threshold responses consist of summation of subjective impressions of trained subjects to their degree of response in terms of eye irritation, nose irritation, pulmonary discomfort, olfactory cognition, and central nervous system effects. These are recorded at appropriate time intervals during the exposure period on a check-off chart, the measurements of which extend over a five-fold scale ranging from "absent" to "extreme". A summary of these data for acrolein, ozone, and sulfur dioxide are presented. It is concluded from this data that measurements of pulmonary function by standard techniques is unlikely to give significant responses in the presence of air pollutants in realistic concentrations, and that a more sensitive technique for recording changes in respiratory mechanics, such as the body plethysmograph, will be required. Similar studies applied to persons both diseased and well, and exposed over a long period of time are needed.

05680

E. R. Darley, J. T. Middleton, and M. J. Garber

PLANT DAMAGE AND EYE IRRITATION FROM OZONE-HYDROCARBON REACTIONS. Agr. Food Chem. 8, (6) 483-5, Dec. 1960. (Presented at the 136th Meeting, American Chemical Society, Atlantic City, N. J., Sept. 1959.)

Gas phase reaction products of several ozone-hydrocarbon mixtures, including mono-olefins, a diolefin, and aromatics, were assessed for their relative ability to damage pinto bean plants and to irritate eyes. Plant damage was obtained from all reactions whose products, after cleavage at the double bond, contained three or more carbon atoms; ozone reactions with propylene and 2-butene produced no phytotoxicant. Injury was markedly reduced by attaching a methyl group at the double bond of a straight-chain olefin; however, there was no difference in injury between cis- and trans- forms of a given olefin. None of the reactions irritated eyes above that amount reported for clean, carbon-filtered air.##

05752

Princi, F.

MEDICAL PERSPECTIVE IN ATMOSPHERIC HYGIENE. J. Am. Med. Assoc., Vol. 182, p. 650-655, Nov. 10, 1962. (Presented at the 111th Annual Meeting, American Medical Association, Chicago, Ill., June 25, 1962.)

Medical literature on air pollution has become overwhelming and persuasive. By implication, the practicing physician is advised that crippling and death-dealing disease is being produced, on all sides, by both known and unknown chemicals in the atmosphere. An outstanding example of this is the confusion concerning chronic bronchitis. The disease is not only poorly defined, but there is also confusion concerning its cause. For years, tobacco smoking, sinusitis, postnasal drip, alcoholism, infection, organic and inorganic irritants, and so forth have been regarded as causative agents in its production. It is said to be characterized by changes in the epithelial mucosa of the tracheo-bronchial tree, and by the expectoration of increasing amounts of sputum of variable consistency. Yet, even this common definition is interpreted differently by different observers. To suggest merely that the incidence of a disease or disease condition is related mathematically to the increase in soot-fall or lower visibility is not helpful to either patients or physicians. The substance in the air that is under suspicion must be examined critically from the point of view of both chemical and physical characteristics. When the component has been identified and classified, its effects must then be measured both in the atmosphere and in the laboratory. There are times when laboratory results are not confirmed in environmental exposures, and vice versa. A remarkable example of this is the fact that acrolein and formaldehyde do not account for all eye irritations in smog, although they appear to do so in simple laboratory systems. About a year ago the steps essential to decisive statesmanship in the field of atmospheric hygiene were listed as follows: (a) A precise statement of the essential characteristics of the environmental problem; (b) An appraisal by competent professional groups of the real and apparent health aspects of the various factors involved; (c) The development of suitable standardized methods for the analysis of exotic chemicals; (d) The design and promulgation of criteria of health, safety, and comfort in the environment; and (e) The toxicological effects of the substances finding their way into the environment must be assessed on a continuing basis by professional groups, preferably rooted in voluntary health agencies rather than government.

05792

P. R. Merrifield and T. M. Graham

THE STATISTICAL EVALUATION OF EYE IRRITATION. Air Pollution Control Assoc. Proc., Semi-Ann. Tech. Conf., San Francisco, Calif., 1957. pp. 17-36.

In the growth of air pollution research, the measurement of eye irritation has become increasingly important. The indices of eye irritation would appear to have the functions of serving as: criteria of the intensity of air pollution or as indicators of the extent to which control procedures must go to minimize the reporting of eye irritations by the relatively sensitive segment of the population. The desirable characteristics and procedures for their use are discussed. Prior review and analysis of previous investigations of methods of measurement, a study was begun with plans to collect the aerometic and eye irrational data in terms of a multrivariate design for correlation and analysis. The aim of the study was to find the lowest concentration of atmospheric

variables that was sufficient to produce eye irritation. A dilution technique was employed to obtain different stimulus levels. The statistical analysis of reports of irritation was performed for each subject separately. The stimulus level for each presentation was computed as the product of the measured amount of constituent in the ambient atmosphere and the proportion of the unfiltered air in the mixture being presented when the subject reported eye irritation. A table showing threshold values for each atmospheric constituent, obtained using the method of minimal change is given. A forced method of determining thresholds was also begun. Although the data processing is incomplete, impressions of the possible effects of particulate matter on the threshold indicate that removal of particulates and gaseous irritants are necessary to decrease eye irritation.##

05814

M. Sherman

TOXICITY OF NITROGEN OXIDES (WITH SUGGESTIONS FOR FURTHER RESEARCH). Preprint. (1961).

A general survey of the known facts and suggestions for further research are included. The topics discussed are nitric oxide, nitrogen dioxide, acute and chronic toxicity, pathologic features, studies of eye irritation, and nitrogen pentoxide. Considerations for future research include: acute and toxicity studies, effect of concentration and time, and nitrogen oxides with other smog components.##

05819

Schuck, E. A. and N. A. Renzetti

EYE IRRITATIONS FORMED DURING PHOTOOXIDATION OF HYDROCARBONS IN THE PRESENCE OF OXIDES OF NITROGEN. (J. Air Pollution Control Assoc.) 10 (1), 389-92 (Oct. 1960). (Presented at the 53rd Annual Conference, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

Individual hydrocarbons were irradiated with near-ultraviolet light in the presence of nitrogen dioxide. Two products of the photooxidations, formaldehyde and acrolein, were found to be eye irritents and to account for the majority of the observed eye irritation found in the photooxidized systems studied. At the concentrations present in the photocxidized mixtures, epoxides, most aldehydes, ketones, nitrites, ketene, ozone, alkyl nitrates, and acyl nitrates were not eye irritants. Terminal olefins in general led to the greatest amounts of irritation. Internal olefins were of lesser importance in the formation of eye irritants in spite of their rapid rates of reaction. Saturates did not contribute to eye irritation because of their slow rates of reaction. (Author summary modified)

05833

Goldsmith, J. R.

AIR CONSERVATION--THE BIOLOGIST'S VIEW. Preprint. (Presented at the American Association for the Advancement of Science Meeting, Cleveland, Ohio, Dec. 29, 1963.)

The biologist's choice choice of the relevant facts that have been established as well as related hypotheses which represent plausible questions for additional study are indicated in outline form. In addition to these findings, there is suggestive evidence leading to the hypothesis that air pollution may be associated with life shortening in experimental animals and perhaps also in humans, and the possibility that air pollutants lead to the increased body burden of potentially harmful substances has been much discussed. Manis biological heritage is one of adaptability. We have adapted physically and biochemically, we have adapted to cultural change we have developed intellectual resources to understand what goes on about us, and to derive predictions from this understanding. We now have the grave obligation to adapt our attitude in light of our knowledge about the atmosphere, and to set to work on air conservation while time permits.

05901

Renzetti, N. A. and Bryan, R. J.

ATMOSPHERIC SAMPLING FOR ALDEHYDES AND EYE IRRITATION IN LOS ANGELES SMOG - 1960. J. Air Pollution Control Assoc. 11 (9), 421-4, 427 (Sept. 1961).

The purpose of the experimental program reported in this paper is to provide an intensive test of the model (rationalizing the observed eye irritation with experimentally determined irritation from formaldehyde and acrolein) by extensive analyses of smog in situ for aldehyde concentrations with simultaneous observations on severity of eye irritation. Ozone and oxidant production was demonstrated to take place in natural ground-level air which had been drawn into a 72-liter flask. This production was sufficient to produce a concentration of oxidant of the same order of magnitude as that found in the ambient outdoor air. Oxidant production occurred both in natural air which was irradiated with visible light in the laboratory and in that which was not irradiated. A similar dark phase oxidant production was observed in synthetic atmospheres. In these cases the reactants were first irradiated in the laboratory and oxidant production was observed in the subsequent dark phase. The use of carbonyl compounds in these experiments holds promise, and one of the synthetic atmospheres utilized in this study which showed dark phase oxidant production was clean air plus 1 1/2 ppm of isobutyraldehyde. (Author summary modified)

C5913

Carey, G. C. R., Phair, J. J., Shephard, R. J., and Thomson, M. I.

THE EFFECTS OF AIR POLLUTION ON HUMAN HEALTH.
Am. Ind. Hyg. Assoc. J. 19, 363-70 (Oct. 1958).

This paper presents a preliminary report of the third survey of a group of three undertaken in 1955-56 in Cincinnati. Cardio-respiratory cripples were selected as subjects and each was visited three times a week by a nurse who obtained the necessary clinical and environmental measurements. Smoke, gaseous acid, temperature, and humidity were measured hourly at three different areas of the town and in the patients homes. Each patient was asked to complete a diary sheet six hourly regarding symptoms such as shortness of breath, coughing, and wheezing. At each visit a series of lung function tests were carried out including: (a) maximum inspiratory and expiratory pressures, (b) timed vital capacity, and (c) carbon monoxide diffusion. It was found that average daily indoor smoke values of 50 percent or more in excess of mean values were experienced during the periods October 12 to 17, and November 18 to 20. One day of very high smoke (150 percent in excess of normal) was experienced on December 4. The patients appear to have reacted significantly to the October and December episodes, although their reactions to the November episode are mixed. In both the October and December episodes, the most striking feature seems to be a prolonged fall in CO uptake commencing about five days after the peak of pollution and persisting for about a week. Measurements of timed vital capacity and of pulmonary pressures do not show clearly defined changes in the patients as a group. However, about 110,000 observations of environmental conditions and patient reactions were obtained and another year will be required before final conclusions can be drawn.

C5924

Blum, H. F.

EFFECTS OF ULTRAVIOLET LIGHT ON MAN. In: Seminar on Human Biometeorology. National Cancer Inst., Princeton, N. J. (PHS Publ. No. 999-AP-25.) (Presented at the Seminar on Human Biometeorology, Cincinnati, Ohio, Jan. 14-17, 1964.) 1967. pp. 73-9.

Ultraviolet light produces a variety of changes in the skin, the relationships between which are obscure. These include the erythema and tanning of sunburn, the production of vitamin D, and the induction of skin cancer. More than one photochemical reaction is concerned, but the site of these must be in the epidermis. The injurious effects of ultraviolet light probably outweigh any beneficial ones. (Author's abstract)

05927

Kornblueh, I. H.

AIR IONS AND HUMAN HEALTH. (In: Seminar on Human Biometeorology.) Pennsylvania Univ., Philadelphia, Dept. of Physical Medicine and Rehabilitation. (PHS Publ. No. 999-AP-25.) (Presented at the Seminar on Human Biometeorology, Cincinnati, Ohio, Jan. 14-17, 1964.) 1967. pp. 145-59.

Air ions in relation to health and medical treatment are discussed. Distribution: In the outdoors environment one finds both positive and negative polarities. Polluted city air shows excessive amounts of large ions, both positive and negative, at the expense of small ones, which are common in clean air in the country. A greater concentration of small ions of both polarities is found in the mountains because of increased UV and cosmic radiation. Outdoor conditions with respect to polluted air are similar to those found indoors, i.e., the number of light, small ions of both polarities decreases in relation to the intermediate and large Langevin types with decrease in ventilation. Medical applications: Hay fever victims show substantial but not lasting improvement and ionization does not cure this disease. Patients with bronchial asthma due to airborne allergens also benefit from ionization. In the case of burn treatment, ionization produces sedating, drying, and deodorizing effects. Treatment of postoperative patients with negative ions indicated pain-relieving and sedating qualities.

06011

R. A. Partridge, J. H. Stebbings, Jr., W. R. Elsea, and W. Winkelstein

OUTBREAK OF ACUTE EYE IRRITATION ASSOCIATED WITH AIR POLLUTION. Public Health Rept. (U. S.) 81(2):153-8 (Feb. 1966). (Presented at the Annual Convention, Medical Society of the Sate of New York, New York City, Feb. 14, 1964.)

An outbreak of acute, severe eye irritation in Buffalo, N.Y., occurred on September 18, 1963. In a random sample of the residential population of the industrial neighborhood where the initial complaints arose, the attack rate was 15 percent. The rate was 48% for persons exposed outdoors 10 minutes or more and only 2% for those remaining outdoors less than 10 minutes. A stagnating anticyclone associated with five consecutive nocturnal inversions dominated meteorologic conditions in Buffalo for 6 days before the episode. Twenty-nine equally strong inversions and 15 instances of 5 or more consecutive nocturnal inversions had occurred, however, during the previous 2 years without evidence of illness associated with air pollution. It was hypothesized that on the morning of the episode a Newson fumigation brought a concentrated layer of irritating pollutants abruptly to ground level, causing the eye irritation. (Authors' summary) ##

06020

L. E. Smith

INHALATION OF THE PHOTOCHEMICAL SMOG COMPOUND PEROXYACETYL NITRATE. Am. J. Public Health 55 (9):1460-1468, (Sept. 1965).

The objective of this project was to determine whether the photochemically produced compound PAN, a natural component of Los Angeles-type smog, affected the oxygen uptake of young men under conditions of moderate exercise of short duration. Since no data were available to define actual ambient levels of PAN, a level expected to be roughly at the diurnal maximum for a day of smog was selected. Thus, the conditions tested might be roughly equivalent to a brief outdoor exercise period for college students. The data were arranged to allow an analysis of variance with the subsequent F test being used to determine the statistical significance of the differences. The results of the present experiment demonstrated a significant effect of the pollutant PAN upon the oxygen uptake of the subjects occurred when they were exposed to the additional stress of exercise. Therefore, future investigators who study the problem of the effect of pollutants upon the respiratory efficiency of man would be advised, wherever possible, to include the phase of exercise in their experimental design. There is now evidence available which conclusively demonstrates that smog - especially the specific smog compcund PAN - is causally associated with the extensive damage of plants. The results of the current study demonstrate that PAN can significantly affect the oxygen uptake of human beings during exercise and the maximal expiratory flow rate during the recovery phase following exercise.##

06048

M. C. Battigelli, F. Hengstenberg, H. J. Mannella, and A. P. Thomas

MUCOCILIARY ACTIVITY. Arch. Environ. Health 12(4):460-466 (April 1966). (Presented at the 30th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 20-21, 1965.)

The mucociliary activity of respiratory epithelia, although well known over many years, has only quite recently assumed new importance, being recognized as one of the basic functions that the respiratory apparatus applies in responding to unfavorable environments. Physical, chemical, and biological "noxae" have been studied in their effects on the mucociliary activity of lower animals, mammals, and in man as well, with techniques that have proved accurate and reproducible. In this paper a brief review is given of these methods and of the results of investigations particularly related to the effects of air pollutants. Results of investigations on the effect of diluted diesel exhaust on the tracheal escalator of rats are summarized. An important finding is that exhaust dilutions that are without measurable effect on the

respiratory resistance of human subjects are actually able to induce changes in tracheal clearance in some of the animals exposed for prolonged duration. With higher levels of exposure tracheal clearance of small mammals is affected with greater frequency. The removal of animals from the exposure invariably restores the original level of activity within a few days. The particulate content of the exhaust appears to play an important role in this type of respiratory injury. (Authors' summary)##

06053

W. C. Cooper and I. R. Tabershaw

BIOLOGIC EFFECTS OF NITROGEN DIOXIDE IN RELATION TO AIR QUALITY STANDARDS. Arch. Environ. Health 12(4):522-530 (Apr. 1966).

Data on the biological effects of nitrogen dioxide on man and lower animals over a wide range of concentrations is reviewed and tabulated. Present evidence suggests that long-continued exposures should not exceed the range 0.5 ppm to 1.0 ppm. This is based on the evidence of increased mortality in lower animals exposed to aerosolized micro-organisms after NO2 exposures and the pathologic effects demonstrable in animals continuously exposed to levels in the range of 4.0 ppm to 5.0 ppm. Brief exposures of a general population should not exceed 3 ppm over a period of 1 hr. This is based on the possible potentiation of infections and on the odor threshold. The recommendations relate to the possible effects of NO2 on health alone. They do not consider potentiation or additive effects nor any contributions to plant damage and visibility. (Authors' summary modified)##

06055

HEALTH PROBLEMS RESULTING FROM PROLONGED EXPOSURE TO AIR POLLUTION IN DIESEL BUS GARAGES. Ind. Health (Japan) 4(1): 1-10 (1966).

An environmental and a health survey of two diesel bus garages in Alexandria (Egypt) have shown an air pollution problem due to the exhaust of engines containing SO2, NO2, aldehydes and hydrocarbons within permissible levels and a relatively higher concentration of smoke. The examination of workers revealed the occurrence of upper respiratory tract disease, chronic bronchitis, asthma, peptic ulcer, gastritis, and high blood pressure in prevalences higher than expected. Respiratory diseases were probably due to a synergistic effect of smoke and irritants as well as the presence of acrolein and adsorbed hydrocarbons and the smoking habits of workers. Cases of chronic dyspepsia and peptic ulcers were probably related to the nervous tension of night shifts, and other factors as the irregularity of meals and the probable swallowing of dissolved irritants. The blood pressure was relatively "higher" among night shift workers. (Authors' abstract, modified)##

06099

R. J. Bryan

INSTRUMENTATION FOR AN AMBIENT AIR ANIMAL EXPOSURE PROJECT. J. Air Pollution Control Assoc. 13 (6), 254-65, June 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

A comprehensive physiological study on the problem of air pollution from automobile exhaust was started by the University of Southern California under a contract with the U.S. Public Health Service. Several different types of experimental animals, including mice, rats, guinea pigs, and rabbits, were to be exposed at four separate locations in the Los Angeles Basin. In determining the possible biological effects of automobile-related air pollution on test aniamals, the planned studies included those for cancer, lung function, blood analysis, enzyme determinations, and tissue tests. The animals were divided into 2 groups, one being supplied untreated ambient air, and the other purified air for a control. All other environmental conditions were designed to be as nearly identical as possible. The design of facilities, including ambient air room ventilation and control room air purification systems, is discussed. In the design of facilities, the most important problem encountered was that of existing limitations on air purification systems. The experimental design concept used in this project called for no alteration of the breathing air provided to control animals except for the removal of air contaminants. It was not possible to provide such a system in which removal of CO, lower molecular weight hydrocarbons, and NO, could be accomplished effectively. Experience to date, however, indicates that the air purification syster selected does remove O3, higher molecular weight hydrocarbons, NC2, and filterable black aerosols quite effectively. The conclusions to date are limited. However, it is concluded that additional design and evaluation projects are necessary in order to improve ventilation and air purification equipment design for environmental exposure projects.##

06163

G. T. Smith

SMOG - ITS ORIGIN. Rocky Mt. Med. J. 64, (3) 55-8, Mar. 1967

Volatile materials produced by vegetation may be responsible for smog as well as man-made products. It has been calculated that one billion tons of volatile organic substances (terpenes) are released per year by vegetation over the surface of the earth. Throughout the world the terpenes are present in the air at concentrations of 2 to 20 parts per billion. It has been postulated that the dissipation of terpenes passes through the same cycle as that of gasoline vapors in producing a pollution haze. These blue hazes are seen especially in the mountain and desert regions

in the U.S. There is some evidence to suggest that these terpenes may be toxic. In Reno, Nevada there was a close correlation between the occurrence of asthma attacks and the concentration of terpenes in the air as determined by monitoring with a gas chromatograph. White rats exposed to 40-60 parts per million of alpha terpene became lethargic in 10 min. Symptoms progressed through agitation, staggering, and finally convulsions in 25 min with death in 30 min. At autopsy, the rats had focal loss of tracheal mucosa, pulmonary edema, and cerebral edema. The adult guinea pigs weighing more than the rats died on the first exposure in 35 to 45 min. The pilot study showed that alpha pinene is toxic in high concentrations to both humans and laboratory animals. The investigation is being continued to study the long term effects of lower concentrations found in nature to determine if pulmonary lesions are produced by prolonged exposure.

06201

Steadman, B. I., R. A. Jones, I. E. Rector, and J. Siegel

EFFECTS ON EXPERIMENTAL ANIMALS OF LONG-TERM CONTINUOUS INHALATION OF NITROGEN DIOXIDE. Toxicol. Appl. Pharmacol. 9 (1), 160-70 (July 1966).

One preliminary acute 8-hour study at a concentration of 123 mg/cu m of nitrogen dioxide, and one 30-day repeated study at a level of 67 mg/cu m were conducted. Both exposures produced marked lung irritation and high mortality in all species. The gross pathologic findings in the lungs of surviving animals indicated hemorrhagic pulmonary edema in the 123 mg/cu m study, and vascular congestionand focal hemorrhage in the 67 mg/cu m study. Five 90-day continuous studies were run at 0.9, 1.0, 9.2, 21.3, and 21.6 mg/cum of nitrogen dioxide. Except for a possible slight weight loss, there were no effects noted at 0.9 and 1.0 mg/cu m. At 9.2 mg/cu m there was a significant increase of mortality in guinea pigs and rabbits, and at the 21.3 and 21.6 mg/cu m levels there was a significant increase in mortality in all species except the dog. Minimal pathologic lung changes were seen at the highest concentrations. Cumulative 30-, 60-, and 90-day mortality data for the continuous exposure studies indicate that one cannot safely extrapolate from the 30-day results to anticipate the effects which may occur after 90 days. Care should also be taken in extrapolating continuous-exposure guidelines from data obtained in repeated-exposure studies. It is believed that the submarine guideline of 0.5 ppm (0.9 mg/cu m) will not cause any untoward effects in personnel exposed continuously for 60 days. The choice of analytical procedure is critical in measuring the concentration to which animals are exposed. Absorption of samples in 0.1 N NaOH is not satisfactory. Absorption directly into the nitriting reagent is the method of choice. (Authors) summary)

06264

A. P. Krueger

AIR IONS AND PHYSIOLOGICAL FUNCTION. J. Gen. Physicl. 45(4), 233-41 (Mar. 1962).

Studies on air ions and physiological function were designed to determine air ion effects on bacteria and the mammalian trachea. In bacteria, the only clear-cut action attributable to air ions was an increase in the rate of death. Observations on excised tracheal strips and on exposed tracheas of anesthetized rabbits, mice, rats, guinea pigs, and monkeys indicated that positive ions produce: (a) decreased ciliary activity, (b) contracture of the posterior tracheal wall, (c) exaggerated vulnerability to trauma, (d) vasoconstriction, and (e) increased rate of respiration. All five effects are seen in the anesthetized tracheotomized animal and the first three are seen in the isolated strip. In studies of gaseous ion effects on the catalytic activity of a modified Keilin-Hartree pig heart homogenate, we found that oxygen anions have a direct effect on cytochrome oxidase and accelerate the cytochrome-linked conversion of succinate to fumarate. This would suggest that the same action may produce a cytochrome-linked oxidation of 5-HT.##

06276

Henry D. Ogden

SOME OBSERVATIONS ON THE OUTBREAKS OF BRONCHIAL ASTHMA IN N. O. (J. Louisiana State Med. Soc.), 116(9):338-341, Sept. 1964. 8 refs. (Presented at the 84th Annual Meeting, Louisiana State Medical Society, Lafayette, May 5, 1964.)

Observations on the episodes of asthma in New Orleans affecting many individuals in a few hours are presented. Attacks of asthma occurred in other parts of the country at the same time of a major flare-up in New Orleans. Air pollution may be a definitely aggravating factor. Possible meteorologic causes may also be associated (magnetic storms, solar phenomenon, air ionization, etc.). There also may be a relationship between a falling humidity and a rising barometric pressure. (Author's summary, modified)##

06341L

W. B. House

TOLERANCE CRITERIA FOR CONTINUOUS INHALATION EXPOSURE TO TOXIC MATERIALS (III. EFFECTS ON ANIMALS OF 90-DAY EXPOSURE TO HYDRAZINE, UNSYMMETRICAL DIMETHYLHYDRAZINE (UDMH), DECABORANE, AND NITROGEN DIOXIDE). Midwest Research Inst., Kansas City, Mo. (Feb. 1964). 92 pp. (Technical Rept. ASD-TR-61-519 (III)
DDD: AD 440275L

Monkeys, rats, and mice were exposed for 90 days to: (a) hydrazine (1.0 ppm), (b) unsymmetrical dimethylhydrazine (UDMH) (0.5 ppm), (c) decaborane (0.05 ppm), and (d) nitrogen dioxide (5.0 ppm), to determine the inhalation toxicity of these agents after continuous exposure. Mortality was high among the animals exposed to hydrazine and decaborane, whereas the losses of animals exposed to UDMH and nitrogen dioxide were relatively low. All three

species exposed to hydrazine developed fatty changes in the liver. In addition, rats and mice had lung lesion. Liver degeneration was involved in monkeys exposed to UDMH, whereas kidney and heart lesions were predominant in rats, and brown pigments, probably hemosiderin, were deposited in the liver of mice. Monkeys on decaborane exhibited fatty changes in the liver and occasional involvement of the kidney and heart. The most marked pulmonary lesions in rats were found in those exposed to decaborane, and lung involvement was also prevalent in mice. The least pathological changes were observed in animals on nitrogen dioxide. Monkeys showed liver degeneration occasionally, whereas both rats and mice had lung lesions. No trace of any of the test compounds was found in the blood of monkeys. Mite infestation of the lung, prevalent among controls as well as treated monkeys, masked possible lesions in this organ which may have been caused by any of the four chemicals. Changes in physiological state of animals as determined by clinical laboratory evaluations, including functional tests and/or hematology, blood chemistry and urinalysis, were relatively few in number. (Author abstract)##

06367

R. F. Bils

RESULTS OF EXPOSURE OF TISSUES TO ATMOSPHERIC POLLUTANTS. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-62.)

Numerous exposure studies have been made using the gaseous constituents of smog. Laboratory animals and tissues have been exposed to nitrogen dioxide, sulfur dioxide, ozone, phosgene, hydrocarbons and automobile exhaust in various concentrations and under various conditions. Definite morphological or functional changes have been observed only when concentrations are many times that in the atmosphere. Four animal exposure stations have been in operation in the Los Angeles area to ascertain the effects of smog on various laboratory animals. During the course of this study alterations in the fine structure on the alveolar tissue have been observed. Control animals were kept at each site in rooms with well-filtered air. Similar groups of animals in other rooms continually breathed the ambient air. Different ages of mice were sacrificed during and after heavy smog periods (2-3 hours over 0.4 ppm total oxidants). Both the control and ambient animals of the 5-month-old groups showed normal alveolar tissues. Typical mitochondria and lamellar inclusions were evident in the alveolar "corner" of wall cells in all ages of the control mice, however, the relative number of these cells seemed to decrease with age. A significant difference was observed between the 9-month-old groups. In the lung tissues taken during the heavy smog few normal mitochondria were present in the epithelial wall cells. The cytoplasm was generally disrupted and contained many lamellar inclusions or fragments. Since the exact time of heavy smog episodes is unpredictable, the possibility of using synthetic photochemical smog was investigated. The total oxidant concentration and reaction patterns approximated those

of a heavy smog day. Many of the wall cells of 8-month-old smog-treated lungs contained substantially fewer normal mitochondria than the controls. Repeated doses of synthetic smog for 3-4 days enhanced the alterations and also resulted in some rupturing of red blood cell membranes and many more alveolar phagocytes. The extent of cellular damage increases significantly from 14 - to 16-month-old mice indicating a thresbold age of sensitivity to photochemical smog. The 16- and 18-month-old animals were severely edematous. Alveoli were nearly full of phagocytes containing many large membrane-bound crystalloids, some over 3 microns in lengths. In the older animals, electron dense lipoidal substance was seen accumulated on some epithelial lining surfaces.##

06415

J. B. Mudd

OXIDATION OF AMINO ACIDS BY OZONE. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-59.)

The following amino acids are susceptible to oxidation by ozone in decreasing order: cysteine, methionine, tryptophan, tyrosine, histidine, cystine, and phenylalanine. Oxidation takes place whether the amino acids are free or in peptide linkage. The amino acid residues of pancreatic ribonuclease most susceptible to oxidation by ozone are tyrosine and histidine: at the time of oxidation there is a concomitant decrease in enzymic activity. (Author abstract)##

06552

A. Goetz

AN INTERPRETATION OF THE SYNERGISTIC EFFECT OF AEROSOLS BASED UPON SPECIFIC SURFACE-ACTION OF THE AIRBORNE PARTICLES. Preprint. (1956).

Experiments to determine the survival time of test animals (mice) exposed to toxic vapor without and with the addition of an aerosol of defined particulate constitution were conducted. As toxic vapor, three different substances were used, (each for itself, i.e. not as mixtures): two aldehydes (formaldehyde and acrolein) and evaporated nitric acid; the concentration of these vapors was kept constant in the presence and absence of the aerosol addition, and it was selected so that the vapor alone caused commonsurable survival periods of the animals. None of the aerosols caused, in the absence of the toxic vapors, any significant change in the test animals. However, when co-existent with the toxic vapors the aerosols caused very marked differences in the mean lifetime of the test animals and proved that certain types of particles produce a Substantial identification of the toxicity of the vapor (shortening of the lifetime), while others had an attenuating effect (lengthening of the lifetime), and also that the attenuating, or the intensifying properties of a particular

aerosol, depended to a large extent on the nature of the toxic vapor. These investigators have attempted to interpret their results qualitatively (and to some extent even quantitatively) by assuming that the vapor be absorbed by the aerosol, i.e. by the gradual incorporation of the vapor into the particle. In view of the fact that the experimental data as well as the manner in which they were obtained, appear to have an unusually significant bearing upon the mucous irritation caused by smog, the present investigation has attempted to interpret this data in terms of nuclear condensation of the toxic vapor, (i.e. of a surface accumulation on the airborne particles).##

06600

Bils, R. F. and J. C. Romanovsky

ULTRASTRUCTURAL ALTERATIONS OF ALVEOLAR TISSUE OF MICE. II. SYNTHETIC PHOTOCHEMICAL SMOG. Arch. Environ. Health, 14(6): 844-858, June 1967. 15 refs.

The possibility of using artificial photochemical smog was investigated. Male A-strain mice were exposed for three hours to previously irradiated synthetic atmospheres which initially contained propylene, nitric oxide, carbon monoxide, and water vapor to simulate the oxidant concentration produced during a heavy smog peak. The lungs of these treated mice showed a pattern of ultrastructural alterations of alveolar tissue similar to that of tissues in heavy natural smog. Wall cell lamellar bodies generally increased in size and number in exposed 8-month-old mice, but only temporarily. Delaying death only 12 hours allowed the lungs to return to normal. Some permanent changes seemed to occur in exposed respiratory tissue of 15-month-old mice. Reasonably good recovery of smog-disrupted alveolar and capillary lining cells took place, but few wall cells remained. More extensive disorganization of wall cell cytoplasm and disruption of lining membranes occurred when the 20-month-old mice breathed the synthetic smog and delayed death allowed further damage and revealed cell debris in the alveoli. Since the synthetic smog produces cytological effects similar to the heavy Los Angeles smog, it may prove to be a useful tool in further studies concerning the effects of photochemical smog on biological systems.

06608

Goldstein, Bernard D., Brian Pearson, Charlotte Lodi, Ramon D. Buckley, and Oscar J. Balchum

THE EFFECT OF OZONE ON MOUSE BLOOD IN VIVO. Arch. Environ. Health, 16(5):648-650, May 1968. 14 refs.

Markedly reduced levels of acetylcholinesterase were found in the erythrocytes of mice exposed in vivo to 8 ppm ozone for four hours. A lesser reduction in glutathione levels was not statistically significant. This tends to support the hypothesis that the cell membrane may be more sensitive to the effects of ozone than the

intracellular constituents and would also support the possible role of lipid peroxidation in the mechanism of ozone toxicity. The finding of a decreased red cell acetylcholinesterase in mice exposed to ozone in vivo supports the conclusion that ozone has extrapulmonary effects.##

06618

Kelly, Frank J. and Wallace E. Gill

OZONE POISONING: SERIOUS HUMAN INTOXICATION. Arch. Environ. Health, 10(3):517-519, March 1965. 10 refs.

A case of serious human ozone poisoning is presented. The inadequacy of relying on detection by odor on the part of even an experienced worker is well illustrated. After the onset of clinical manifestations progression to loss of consciousness can be alarmingly rapid. The response to inhalation oxygen may be of considerable diagnostic help as well as an effective therapeutic measure. The rapid clinical response to the administration of oxygen is of special interest as this case confirms the extensive experimental evidence of Mittler et al. In their study it was found that rats exposed to ozone in oxygen were apparently protected from death by the 100% oxygen present in the chamber, because they survived high concentrations during the exposure but died within a matter of minutes when brought into room air. However, the protective action of oxygen in the case of mice persisted even after the animals were brought into room air.##

06635

M. Spotnitz

THE EFFECTS OF AIR POLLUTION ON MILITARY PERSONNEL IN JAPAN (ANNUAL PROGRESS REPT. JULY 1, 1962-JUNE 30, 1963). Zama Army Hospital, Japan, Pulmonary Lab. (1963). 20 pp. (Rept. No. RCS-MEDDH-288.)
DDC: AD 407081

An investigation was undertaken to determine if the same air pollution bronchitis could be detected in Osaka and Kobe, Japan, that was present in the Tokyo-Yokohama area. Twenty-eight patients in that area were given a questionnaire and had pulmonary function tests performed on them. No cases among the asthmatics in that area resembled that in the Kanto Plains. A prospective study to determine incidence, physiological changes, effects of treatment and possible residuals of Yokohama was begun. Patients (783) were evaluated with a questionnaire and pulmonary function tests after arrival in Japan. A number of these patients were noted to have abnormal pulmonary function tests on arrival in Japan and of these the majority were heavy smokers. Eight patients with Yokohama asthma were treated in a specially constructed room with air filtration by electrostatic precipitators, air conditioners and charcoal filters. This treatment induced a remission of the disease in the eight patients, which was only temporary in several after they were returned to

duty. Several patients with Yokohama asthma were found to have an increased residual volume. These patients, even after treatment which succeeded in making them asymptomatic, were found to have persistently elevated residual volume determinations. (Author abstract)##

06640

M. C. Battigelli, R. J. Mannella, and T. F. Hatch

ENVIRONMENTAL AND CLINICAL INVESTIGATION OF WORKMEN EXPOSED TO DIESEL EXHAUST IN RAILROAD ENGINE HOUSES. Ind. Med. Surg., 33, 121-4 (Mar. 1964).

Within the limits of exposure to diesel exhaust products, of locomotive repairmen in three representative railroad engine houses over a period up to 15 years (average duration of 10 years), 210 workers (average age -- 50 years) did not show any significant difference in pulmonary function performance from a group of 154 railroad yard workers (average age -- 50 years) of comparable job status but without history of exposure to diesel exhaust products. Environmental studies in two engine houses revealed levels of exposure to several known constituents of diesel exhaust which were well within the tolerable limits of these substances considered as separate agents. These low values support the negative medical and physiological findings. In contrast, this investigation suggests higher frequency of respiratory complaints, physical examination of abnormalities of the chest, and decreased pulmonary function and performance of cigarette smokers compared to non-smokers regardless of occupation. (Authors' summary)##

06669

A. A. Minkh

IONIC STATE OF AIR IN LIVING QUARTERS AND ITS HYGIENIC SIGNIFICANCE . U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 249-55, 1962. (Gigiena i Sanit.,) 25 (1) 78-83 (1960). Russ. (Tr.)
CFSTI: 62-11103

An attempt was made to evaluate the physiological significance of the changes produced by air ionization of living quarters and of the public buildings. Factors affecting the state of indoor air ionization are discussed. Arguments are presented for and against the theory that fluctuations in the ionic state of indoor air affect the human body. The question of the advisability of artificial air ionization is considered, and it is concluded that the problem requires further study.##

06680

Hervy P. Elkins

EXCRETORY AND BIOLOGIC THRESHOLD LIMITS. Am. Ind. Hyg. Assoc. J., 28(4):305-314, July-Aug. 1967. 27 refs.

"The Industrial Hygienist today recognizes that the peril incurred by the inhalation of harmful dust is a function of two variable factors - the degree of harmful exposure and the specific susceptibility of the exposed individual to .... injury." The preceding statement was made by Don Cummings in a paper published in 1938. The following year he repeated a suggestion he had discussed previously. "...It is also suggested that for each hazardous industrial dust two limiting concentrations should be established. The first, to be designated as the primary threshold, should express that concentration of dust in which a healthy man may be employed for a working lifetime without incurring a disabling injury. The second, to be designated as the secondary threshold, should express that concentration of dust in which a healthy man will inevitably contract silicosis if regularly employed for many years." Practically all industrial hygienists presently pay lip service to the principle stated in the first of these statements. The suggestion in the second statement has been only half adopted. Threshold limits, so-called, or under a different name, have been prepared for [illegible] 400 industrial hazards by various organizations in this country and abroad. There seems to be some confusion outside, if not within, the profession, however, over whether these values correspond to the primary or secondary limits. Certainly, when the observation that one or two workers can endure concentrations well above the Threshold Limit Value for a few months, without obvious ill effects, leads to the conclusion that the threshold limit is too low, it would seem that the observer has the secondary threshold in mind, rather than the primary one. The only biologic fluid finding much application for exposure tests is blood; limited use has been made of biopsy specimens of lung, skin and fat, but these are not very practical for periodic sampling. The excretory products most frequently analyzed are urine and breath; sweat, the other major excretion product, is not well adapted for exposure tests.##

06689

Sterling, T. D., S. V. Pollack, and J. J. Phair

URBAN HOSPITAL MORBIDITY AND AIR POLLUTION. (A SECOND REPORT.) Arch. Environ. Health, 15(3):362-374, Sept. 1967. 3 refs.

This analysis deals with morbidity as indicated by the length of stay in the hospital of admitted patients. Length of stay represents a measure of severity of illness which might be more indicative of stresses encountered than admission rate in itself. Also, responsiveness of a hospital patient to a particular pollutant can be related meaningfully especially if the latter is measured in close proximity to the place of confinement. This

method may be more sensitive than studying hospitalized cases coming from various areas of the city, albeit that the service areas of individual hospitals have a tendency to be fairly restricted and specific. The investigators were given access to large data-sets in Cincinnati, Ohio and Los Angeles, California. The data were in such a form that they could readily and cheaply be processed by automatic data equipment. The Cincinnati data recorded accorded them the opportunity to test out some of their hypotheses on a relatively small volume of data. Additionally, they were able to develop the relevant computer techniques and programs. The acquired facility in understanding and technique was then applied to the more voluminous Los Angeles data. Thisreport concerns itself with the analysis of the relation between air pollution and length of stay of patients in the larger Los Angeles hospitals serving Blue Cross admissions.##

06691

E. J. Sabaroff

THE BIO-PSYCHO-SOCIOLOGICAL EFFECTS OF THE ENVIRONMENT ON MAN (AN ANALYSIS OF CURRENTLY AVAILABLE INFORMATION). ((Rhode Island School of Design, Providence, R.I.)) 114 pp. (Apr. 1966).

This study is designed to obtain reliable information concerning the effects of the environment on man so that designers can provide the optimum environment in the buildings that are so desperatley needed by our ever increasingly complex urban society. The literature was carefully searched to locate studies which investigate these effects. An annotated bibliography of selected studies is included in the report. Because individuals are so varied in their physiological, psychological, and sociological makeup, and because man is so wonderfully adaptable, measuring the effects of various stimuli is extremely difficult. In addition, because most studies in this area are burdened with the ususal restrictions of inadequate funds, staff and equipment, the normal procedures of scientific methodology are all too often neglected, and hence the conclusions reached are completely unreliable. This study outlines the variations (both permanent and changeable) that are found in man, classifies the various environmental phenomena that affect his well-being, and proposes a systematic program of thorough research which will provide the data which are so desperatley needed, and which are not now available. (Author summary)##

06717

Wagner, W. D., B. B. Duncan, E. G. Wright, and H. E. Stokinger

EXPERIMENTAL STUDY OF THRESHOLD LIMIT OF NO2. Arch. Environ. Health, 10(3):455-466, March 1965. 34 refs. (Presented at the Annual Meeting, American Industrial Hygiene Assoc., Washington, D.C., May 17, 1962.)

In an attempt to provide information on long-term nitrogen dioxide toxicity, three chronic animal studies that both included and bracketed the present threshold limit of 5 ppm were performed. Six species of laboratory animals (dog, rabbit, guinea pig, rat, hamster, mouse) were exposed daily for periods up to 18 months to pure nitrogen dioxide at closely controlled concentrations of 5 ppm, the present threshold limit, and levels one fifth as high, 1 ppm, and five times greater, 25 ppm. Control groups were used throughout the studies. At no exposure level did changes in body weight, hematologic values, or biochemical indices deviate significantly from the control data. Studies with a spontaneous pulmonary tumor-susceptible strain of mice suggested, under these conditions of exposure, a possible tumorigenic accelerating capacity for NO2. Respiratory function test results on exposed rabbits were equivalent to the controls, with the exception of the 25 ppm group, which indicated a slight and transitory elevation in mean O2 consumption. Tolerance in aging rats and mice to acute lethal effects of NO2, following extended periods of development from exposure at 5 ppm and 25 ppm, was achieved to a significant degree. Detailed histologic evaluation of tissues of serially sacrificed exposed animals and their controls presented no evidence, with any of the animal species used, that nitrogen dioxide, in the concentrations employed and in the duration of exposures, had any demonstrably morphologic effect on either production of pulmonary lesions or the susceptibility of the animals to a pulmonary inflammatory process. These data present reliable evidence for the present 5 ppm threshold limit value for nitrogen dioxide, with the added caution that 5 ppm should represent a ceiling on the basis of suggestive lung tumorigenesis.##

06745

G. B. Haydon, J. T. Davidson, G. A. Lillington, and K. Wasserman

NITROGEN DIOXIDE-INDUCED EMPHYSEMA IN RABBITS. Am. Rev. Respirat. Diseases 95, (5) 797-805, May 1967.

A study was made of the pulmonary pathology in rabbits after exposure to an atmosphere containing 8-12 ppm of nitrogen dioxide. This work is an extension of similar work done with rats by Freeman et al. in which anatomic changes associated with emphysema developed with exposures to nitrogen dioxide at levels below those that cause acute pulmonary edema. Rabbits were continuously exposed to an atmosphere of 8-12 ppm of nitrogen dioxide for 3 to 4 months. Histopathological examination was made of the lungs of 18 rabbits that survived and of 3 rabbits who were allowed to recover for one week to a month. Irreversible destructive changes in the alveolar walls, accompanied by an abnormal enlargement of the distal air spaces were seen in the lungs of the exposed rabbits. The changes were compatible with diagnosis of emphysema. Reversible histopathologic changes in the bronchioles appeared to account for the increase in the non-elastic resistance measured in some of these rabbits. Two processes are postulated which might initiate the pulmonary emphysema. In one, the principal injury produces focal tissue necrosis in the alveolar

walls that leads, perhaps, to elastic tissue destruction followed by abnormal enlargement of the peripheral air spaces. In the other, the principal injury causes a chronic airway obstruction, leading to hyperinflation of the lungs, which may be followed by tissue injury and various degrees of tissue disruption.##

06746

J. T. Davidson, G. A. Lillington, G. B. Haydon, and K. Wasserman

PHYSIOLOGIC CHANGES IN THE LUNGS OF RABBITS CONTINUOUSLY EXPOSED TO NITROGEN DIOXIDE. Am. Rev. Respirat. Diseases 95, (5) 790-6, May 1967.

Experiments were carried out to determine the effect of prolonged continuous exposure to 8-12 ppm of nitrogen dioxide on the pulmonary function in rabbits and to obtain a physiologic explanation of the nature of the lesion. Rabbits were exposed continuously to 8-12 ppm of nitrogen dioxide for 3-4 months. Pulmonary function studies were carried out on anesthetized controls and experimental animals studied 4 days to one month after the termination of the exposure. The functional residual capacity increased as did the nonelastic resistance. There was no significant change in the carbon dioxide tension. On removal from the exposure chamber, the physiologic changes were completely reversed. Pathologic studies suggest that the obstructive changes are caused by bronchiolitis. Destructive changes that persisted during the recovery period resemble emphysema, but were not sufficiently severe to have resulted in significant physiolcgic abnormality.##

06786

K. Kato

(IONS IN AIR: 3. IONS AND ENVIRONMENTAL HYGIENE AND 4. EFFECT OF IONS ON THE LIVING BODY.) Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo) 2 (2), 48-50 (1964.) Jap.

The relation between the number of ions in air and their effect on the human body is discussed. The number of ions is tabulated in clean air, in dirty air in summer and winter, in a heated room with a multipanel, dust collector or electrical precipitator, and in an air cooled room with an electrical precipitator. In the heated room with the multipanel collector, the ion concentration is smaller than in clean or dirty air, whereas in the heated room using an electrical precipitator, the concentration of positive ions is increased and that of negative ions decreased. Concerning the effects of ions on the human body, tests indicated that negative ions have a calming effect whereas positive ions tend to stimulate. With an ion concentration of more than 10 to the 7th power/cc, high blood pressure, giddiness, discomfort, and fatigue result. Exposure to a concentration of negative ions for 15 to 20 min/day for 5 months resulted in a decrease in absences due to illness in

working men and exposure of ten children (living in an industrial area) under the same condition showed a curative effect on headache and sore throat. The effects of concentrations of ions on various parts of the body are tabulated. The calming effect of negative ions on the heart and respiratory system after exposure at a concentration of 10 to the 6th. power ions/cc for 30 min/day for 2 or 3 days/week is demonstrated.##

06840

D. E. Rounds

THE EFFECT OF AIR POLLUTANTS ON CELLS IN VITRO. Preprint. (1964).

In this study the areas of investigation fell into three categories: (1) The effect of hydrocarbon mixtures on cells in tissue culture, (2) The effect of air pollutants on respiratory activity, and (3) Considerations of a vital constituent (surfactant) of the lung under normal and pathological or treated conditions. Since mitotic events are interrelated with the rate of increase of the total cell population, it was concluded that an evaluation of the effect of auto exhaust on cell number can provide a simple, reproducible, and sensitive test system for estimating the relative concentrations of physiologically active components of automobile emissions. It was observed that serial dilution of hydrocarbons stimulated the growth rate of human fetal lung cells and an established line of conjunctival elements in a linear fashion. Anaphase and telophase figures which resulted from a 24-hour treatment with 3'Me-DAB and air pollutants revealed a twofold increase in the incidence of bridged or lagging chromosomes. Time-lapse cinematographic records of the mitochondria of cells treated with ozone in culture revealed that these organoids undergo morphological alterations which suggested a loss of respiratory function of these cells. Oxygen depletion with time was proportional to the cell number with 250,000 to 500,000 control cells showing a decrease of 35 to 50 mm Hg of O2 pressure over a two-hour period. A careful comparison of mitochondrial images of alveolar wall cells, taken before and after treatment with 20 ppm $NaNO_2$, suggested some degree of transformation of the filamentous morphology of the globular form. Studies on surface tension of mixtures of normal and oxygen poisoned lung extracts and studies using ultraviolet fluorescent microscopy, suggest that oxygen poisoning results in both absence of surfactant and presence of an inhibitor.##

07098

Noro, L., V. Pirila, and A. Laamanen

AIR POLLUTION AND ALLERGY. (Work Environ. Health (Helsinki),) Vol. 1, p. 2-15, Oct. 1962.

The authors current knowledge regarding the problem of air pollution and allergy is reviewed and observations made in Finland are presented. Air pollution is divided into natural and

cultural the former deriving from wind pollinated plants and the latter from industrial sources. Emphasis is on cultural pollution and major pollutants such as SO2, beryllium, and fluorine are treated individually. It is pointed out that there is a disparity between maximum allowable concentrations, as commonly set, and concentrations tolerated by allergic individuals.##

07099

Peterson, D. C. and H. L. Andrews

THE ROLE OF OZONE IN RADIATION AVOIDANCE IN THE MOUSE.
Radiation Res., 19:331-336, May-Aug. 1963. 6 refs.

The experiments reported here are designed to assess the role of ozone in the avoidance reaction. Mice subjected to ozone in one-half of a test cage show a decreased activity and an avoidance reaction similar to that seen with radiation. With ozone alone, the reaction is elicited only when the environmental concentrations are several times as great as those produced by an effective X-ray beam. No change in the radiation avoidance reaction is observed when the oxygen concentration in the cage is raised to 95%. (Authors' summary, modified)##

07162

B. G. Ferris, Jr. and N. R. Frank

AIR POLLUTION AND DISEASE. Anesthesiology 25(4):470-478
Aug. 1964.

Atmospheric pollution can be classified under three headings: general, occupational and personal. The components are complex and variable so that it is difficult to extrapolate the prevalence of disease in one area to that of another unless the two have similar chemical compositions. Significant exposures can occur at work and may produce impairment of respiratory function. It is emphasized that tobacco smoking, and particularly cigarette smoking, is a most important factor in the causation of chronic nonspecific respiratory disease. Much research has been done to elucidate the mechanism whereby such changes are induced but specific answers concerning the mechanisms have not been forthcoming. Tables are included showing types of atmospheric pollution; comparison of Los Angeles and London types of pollution; categories of airborne materials with selected examples that may occur in industry and that may cause disease; age standardized rates of respiratory diseases by tobacco usage and sex; age standardized rates (%) of respiratory disease by current cigarette smoking habits and sex.##

07173

D. Henschler, E. Hahn, and W. Assmann.

CONDITIONS FOR AN INCREASE IN TOLERANCE UPON REPEATED INHALATION OF IRRITATING GASES WHICH CAUSE PULMONARY EDEMA. ((Wirkungsbedingungen einer Toleranzsteigerung bei wiederholter Einatmung von Lungenodem erzeugenden Reizgasen.)) Arch. Exptl. Pathol. Pharmakol. Vol. 249:325-342 (Nov. 6, 1964). Ger.

Opinions are divergent concerning the effect of long-term inhalation of low concentrations of gases and aerosols which can cause pulmonary edema. This paper investigates the time relationships in the formation of increased tolerance to such gases, its duration, the influence of time and concentration, and the pathological-anatomical reaction of lung tissue to the preliminary treatment. After the protective mechanism was proved to be independent of the chemical structure of the irritant, NO2 was chosed as representative of the gases causing pulmonary edema. Most of the labcratory animals used were inbred mice of the CFW and NMRI families (Zentral-institut fur Versuchstierzucht, Hannover), which were brought into the test weighing 18-22 gm. Increased tolerance to high concentrations of NO2 was obtained by exposing the specimens to 40 ppm NO2 for one 6-hr period. The protection reaction first appears within 24 hr. Maximum protection occurs in 2-5 days and is largely gone after 10 days. Repeated preliminary exposure with the same concentrations at 4-day intervals does not increase the amount or duration of protection.##

07174

H. W. Schlipkoter and A. Brockhaus

TESTS ON THE EFFECT OF GASEOUS AIR POLLUTION ON THE DEPCSITICN AND EIIMINATION OF INHALED DUSTS. ((Versuche uber den Einfluss gasformiger Luftverunreinigungen auf die Deposition und Elimination inhalierter Staube.)) ZBL Bakt. 191(12):339-344 Dec. 1963. Ger.

To be injuricus to men, suspended particles in the atmosphere must be inhaled and deposited in the lungs. Only particles smaller than 5 microns and especially smaller than 1 micron can penetrate into deep secticns of the lungs. Other important factors are the type and dissolvability of the dust as well as the volume and frequency of respiration. To determine the deposition of dust in lungs, it is necessary to determine the difference between the dust content of inhaled and exhaled air. A test conducted to determine the effect of gases found in large cities on the amount of dust deposited in lungs utilized a mixture of 2 types of soot with air which was sprayed and measured with a special apparatus. Spectrophotometric and quantitative methods were used to determine the amount of dust deposited in the lungs of test persons who respired at a rate of 1% breaths per minute, temperature of 23 deg. C, and a humidity of about 68%. Typical

gases mixed with the test suspension in the dust chamber were SO2 and CO2 or NO2 in concentrations which correspond to the MAK values. An increase in dust deposition in the lungs was observed only when nitrogen gases were inhaled simultaneously. Further tests showed that the elimination of deposited dust from the lungs is hindered by SO2 and SO3.##

07240

Petr, B. and P. Schmidt

THE INFLUENCE OF THE ATMOSPHERE CONTAMINATED BY SULFUR DIOXIDE AND NITROUS GASES ON THE HEALTH OF CHILDREN. ((Der Einfluss der durch Schwefeldioxid und Nitrose Gase verunreinigten Atmosphare auf den Gesundheitszustand der Kinder.)) Translated from German. Z. Ges. Hyg. Grenzg. (Berlin), 13(1):34-38, Jan. 1967. 4 refs.

Evidence that sulfur dioxide and nitrogen gases which are effective in low concentrations also produce changes in the individual indicators of group diagnostics is demonstrated. Differentiation was made between effects on control groups and the group from the polluted atmosphere as well as between the influence of both the combined effect of sulfur dioxide and nitrogen peroxide and the effect of sulfur dioxide alone. The method of the erythrogram is also described. This method is based on the increase of the number of erythrocytes in children living in air-polluted areas. The methemoglobin level in the blood of children is significantly increased by the air pollution caused by nitrogen peroxide in the surrounding of large chemical works. Thus, another possible cause of the development of inapparent methemoglobinemia in school children between the ages of 8 to 10 is explained. (Authors' summary, modified)##

07251

TOLERABLE LIMITS FOR TOXIC MATERIALS IN INDUSTRY. DIVERGENCES AND POINTS OF AGREEMENT AT THE INTERNATIONAL LEVEL. (1) ((Les limites tolerables pour les substances toxiques dans l'industrie divergences et points d'accord a l'echelle internationale. (1))) ((Arch. Maladies Profess. Med. Trav. Securite Sociale (Paris))), 26(1-2):41-56, Feb. 1965. Text in French.

The report of the International Committee on the Study of Tolerable Limits presented to the XIV International Symposium on Maximum Tolerable Concentrations of Toxic Materials in Industry held in Paris in 1963, which are given, represent a summary of the present knowledge on maximum allowable concentrations. The chief difficulty in establishing international standards involves the widely different views of the concept of tolerable limits and the methodologies of the U.S. and Russia. The study of the effects of many toxic materials on the central nervous system by Russian workers has led to the establishment of standards that are much more rigid than the U.S.

standards for many materials. The Russian and U.S. limits for some toxic materials is mg/cu m, respectively are: ethylene oxide 1 and 90; chlordane 0.01 and 2.0; carbon tetrachloride 20 and 160. For 34 gases and 8 dusts, fumes, and mists, the Soviet standards are at least one fifth of the U.S. limits and in most cases even less. Some workers object to the methods used by the Russian experts on the grounds that they are too sensitive and show physiological rather than pathological effects. Because of the differences in concepts, the objective approach should be a discussion of the interpretation of the results obtained by both groups to understand and reconcile the different approaches. Fortunately, there are 21 gases and vapors and 19 dusts, fumes, and mists in which there is practical agreement and which can serve as a core for international standards which can be amplified with an exchange of information and results. There is a necessity for further research to obtain data to permit the establishment of zones of tolerable concentrations rather than rigorous limits.##

07270

Advisory Committee on Tetraethyl Lead, Washington, D. C.

PUBLIC HEALTH ASPECTS OF INCREASING TETRAETHYL LEAD CONTENT IN MOTOR FUEL. ((Public Health Service, Washington, D. C., Occupational Health Program,)) PHS Publ. no. 712, 49p., 1959. 7 refs.
GPO: 526258-59-2

The advice of the Pulbic Health Service was sought on increasing the maximum concentration of tetraethyl lead (TEL) in auto gasoline from 3.0 to 4.0 cc per gallon. An ad hoc committee was appointed to determine whether the proposed increase represented a public health hazard. Data on technical reasons for the increase, the results of research, the consumption of TEL by year, and a review of the medical problems are presented by the Ethyl Corp. Representatives of the duPont Co. supplied production figures, and information on actual and estimated TEL demand on U. S. producers. The Committee concluded that (1) a change in the maximum concentration of tetraethyl lead in motor fuel from 3.0 to 4.0 cc. would not increase the hazards involved in the manufacture and distribution of leaded gasoline and (2) available data do not indicate that such change would significantly increase the hazard to public health from air pollution.##

C7347

C. Choffel

PNEUMOCONIOSIS OF ARC WELDERS. ((La Pneumoconiose de Soudeurs a l'Arc.)) Text in French. Gaz. Med. France (Paris), 73(21):4171-4172, 4175-4176, 4179-4180, Nov. 1966.

Pneumoconiosis from exposure to the fumes of arc welding is discussed and the information in the literature is reviewed. The true arc welder's pneumoconiosis results from inhalation of the very fine fumes given off during the fusion of the metals.

In operations carried on in confined spaces with poor ventilation, there is a possibility of sericus pulmonary exposure with acute edema from the exposure to ozone and the oxides of nitrogen. The clinical development of welder"s pneumoconiosis, a type of siderosis, is gradual and benign in nature. In some cases, a fibrosis develops and eventually an alveolar emphysema occurs which may produce a respiratory insufficiency of the obstructive type. The clinical symptoms in some arc welders are the result of inhalation of noxious dusts in the course of their work. Whether or not the condition can be considered to be sidero-silicosis, the pneumcconiosis of arc-welders should be placed on the schedule of legally recognized occupational diseases.##

07541

P. Polu, P. Laurent, C. H. Guyotjeannin, D. Thin

AN OCCUPATIONAL DISEASE OF CHIMNEY SWEEPS CLEANING OIL-FIRED FURNACES. (Pathologie professionnelle des fumistes effectuant le ramonage des chaufferies a mazout.) Text in French. Arch. Maladies Profess. Med. Trav. Securite Social (Paris), 26(4-5):435-446, April-May 1967. 8 refs.

The frequent and consistent symptoms experienced by chimney sweeps cleaning oil-fired furnaces appear to present a new specific syndrome. Most of the efforts of industrial hygienists have been concentrated on the pollution in the air and not much has been done on the chemistry cf soots. Findings, hypotheses as well as suggestions for control are presented. A table is given which compares the symptoms of the workers such as irritation of the eyes, the upper respiratory tract, the mouth, and skin as well as serious deterioration of their clothing. The men also complained of lcss of appetite, nausea, vomiting, lack of coordination of movements, amnesia, and headache. In the same table in parallel columns are listed the symptoms cf exposure to vanadium, sulfur dioxide, and oxides of nitrogen. Based on an examination of the soot involved it was concluded that the vanadium was not involved in the symptoms of the chimney sweeps and that the sulfur content of the fuel was an important factor. It is recommended that fuels lcw in sulfur be used, that the optimum combustion conditions be maintained by keeping the temperature of the flame down by a high excess of outside air. Electrostatic precipitatcrs can cut the emission cf SO3 by 50%. The injection of magnesia in the vicinity of the flame can neutralize the SO3< The use of industrial-type vacuum cleaners offers a method of furnace cleaning without an occupational exposure.##

07591

Horai, Z., M. Yokoi, M. Shibata, M. Okazaki. and H. Watanabe

AIR POLLUTION IN OSAKA AND ITS CHRONIC EFFECT UPON THE HUMAN

BODY. J. Nara Med. Assoc., 17(5-6):403-414, Nov. 1966. 17 refs.

Results are tabulated for suspending and settling dusts and sulfur dioxide measurements in the city of Osaka over several years. A comparison is given of the number of days of smog occurring in Tokyo and Osaka. The chronic effects of air pollution were studied by examining male and female residents of Osaka age 60 and older. A comparison was made between smokers and nonsmokers of the following: occurrence of coughing and expectoration; forced expiratory volume; and abnormal linear shadows on x-rays. Also reported are the results of studies made of lungs from 2600 autopsy cases in Osaka regarding the degree of black-dust deposition, grouped according to age.##

07598

Bonnevie, P.

ATMOSPHERIC CONTAMINANTS AND HUMAN HEALTH. Preprint, Copenhagen Univ., Denmark, 5p., 1963. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963, Paper No. WHO/AP/7.)

The manner in which atmospheric contaminants are harmful to human health is briefly considered. When the normal limit of adaptation is surpassed, some disorder arises and this disturbance of the balance between man and his environment results in a deterioration of the health status. Therefore, the effects of man-made air contaminants have to be estimated as harmful or injurious to health, not only when they provoke signs or symptoms of illness, but also when they disturb the healthy balance between the organism and the atmosphere in contact with it. The adaptative forces may be overburdened or be overstimulated, the result being deficient reaction or too strong a reaction. Many of the respiratory reactions provoked by aerosols may also be provoked by pure air containing different amounts of gaseous ions. Air pollution research ought also to comprise the effects of the ionization of the air on man, his wellbeing and susceptibility to disease, in addition to research on other basic physiological responses to different compositions of air.##

07657

Easton, Richard E. and Sheldon D. Murphy

EXPERIMENTAL OZONE PREEXPOSURE AND HISTAMINE. EFFECT ON THE ACUTE TOXICITY AND RESPIRATORY FUNCTION EFFECTS OF HISTAMINE IN GUINEA PIGS. Arch. Environ. Health, 15(2):160-166, Aug. 1967. 22 refs. (Presented in part at the 5th Annual Meeting, Society of Toxicology, Williamsburg, Va., March 8, 1966.)

In a preliminary study the action of various drugs on the

respiratory effects of air contaminants in guinea pigs showed that ozone-exposed guinea pigs were more susceptible to the toxic action of histamine than animals which had not been exposed to the gas. The data presented in this report confirm and extend that preliminary observation. Random-bred male guinea pigs (250 to 400 gm) were used. The animals were housed in air-conditioned laboratories and were fed a standard guinea pig diet supplemented with greens twice weekly. For the mortality studies the animals were individually caged and placed in six cu ft stainless steel exposure chambers. Ozone was produced by metering filtered, dried air or oxygen (for high concentration experiments) through a dielectric ozone generator. Histamine dihydrochloride was administered subcutaneously in saline (0.9 percent sodium chloride) solution. The histamine concentrations of the solutions were adjusted so that an injection volume of 0.5 ml/kg contained the desired dose. For administration as an aerosol, a 0.5 percent aqueous solution of histamine dihydrochloride was aerosolized in a generator operating under 15 lb/sq in pressure. The plethysmograph -intrapleural catheter technique of Amdur and Mead was used for measuring the effects of ozone and histamine on the pulmonary flow resistance (PR), lung compliance (LC), respiratory frequency (f), and tidal volume (TV) of guinea pigs. For measurements of lung water, the lungs were dissected just above the tracheal bifurcation, trimmed, gently blotted, weighed, and dried at 130 C plus or minus 5 C for 24 hours, and weighed again. Analyses of the histamine content of lungs were performed by the fluorometric method described by Shore et al. The results are expressed as micrograms of histamine base per gram of lung. Increased susceptibility to histamine was detectable for as long as 12 hours after the end of a two-hour exposure to 5 ppm of ozone. The effect of injected histamine on the respiratory mechanics of guinea pigs was greater in ozone-preexposed than in control animals at a time when residual functional effects of ozone were no longer detectable.

07746

Frey, Allan H.

MODIFICATION OF THE CONDITIONED EMOTIONAL RESPONSE BY TREATMENT WITH SMALL NEGATIVE AIR IONS. J. Comp. Physiol. Psychol., 63(1):121-125, 1967. 12 refs.
CFSTI, DDC: AD 649433

From the hypothesis that treatment with small negative air ions causes a depletion of brain 5-hydroxytryptamine, it is predicted that a measure of mood or emotion will be affected by air ion treatment. The conditioned emotional response technique described by Brady provided the dependent variable. Results of 2 experiments, the 2nd essentially a replication of the 1st, are in accordance with the prediction. The inhibition of response in the animal was reduced by treatment with small negative air ions, as it was with reserpine. (Author's abstract)

07821T

Gilgen, A. and H. U. Wanner

THE TOXICOLOGICAL AND HYGIENIC SIGNIFICANCE OF OZONE. ((Die toxikologische und hygienische Bedeutung des Ozons.)) Arch. Hyg. Bakteriol. (Munich), 150(1-2):62-78, 1966. 62 refs.

The toxicological and bactericidal properties of ozone are reviewed. The acute toxicity of ozone to laboratory animals is reported as being diverse and variable from species to species. Chronical exposure results in damage to the respiratory organs, i.e., in bronchitis and lung emphysema, limitation in weight increase of young animals and reduced urine acidity. When man is exposed to 4 to 5 ppm, a lung edema develops within a few hours. Lower concentrations primarily affect respiration by irritation and cause headaches and nausea. In animals, the exposure to low ozone concentrations produces immunity to subsequently applied lethal doses. Tolerance to ozone has also been brought about by germanium oxide. Conversely, ozone has been shown to produce tolerance for ketene, H2O2 and NO2. The mode by which ozone becomes biologically effective is not yet fully elucidated. Presumably free radicals causing oxidation processes are formed, similar to those produced by nuclear radiation. These processes, in turn, set free adrenalin, noradrenalin and bradykinin. The strongest bactericidal effects of ozone are obtained at high relative humidity and low temperature. In practice the germicidal effect of ozone can only be applied to sterilizing water. The deodorizing effect is generally accepted but requires concentrations exceeding the maximum allowable concentrations.

07834

Wanner, H. U. and A. Gilgen

INVESTIGATIONS OF ROOM OZONIZERS AND OF OZONE IN FREE AIR AND INDUSTRIAL FACILITIES. ((Untersuchungen uber Raumozonisatoren und uber Ozon-Vorkommen in der Aussenluft und in Industriebetrieben.)) Text in German. Arch. Hyg. Bakteriol. (Munich), 150(1-2):78-91, 1966. 26 refs.

Ozone in concentrations above 0.05 ppm causes headaches, nausea and respiratory discomfort. Numerous toxicological investigations have indicated that the maximum allowable concentration for ozone should be 0.05 ppm. Twenty-six references on the measurement of ozone in the atmosphere are reviewed and the properties and the occurrence of ozone are summarized. Small amounts of ozone are detected chemically by the amount of iodine generated in a solution of potassium iodide. Ozone production by various kinds of industrial equipment such as generators, electrofilters and film projectors has been found to produce concentrations of 0.04 to 0.1 ppm. Ozonizers can cause concentrations of between 0.02 and 0.03 ppm. Ozonizers should not be used in rooms since no evidence of favorable effects can be found for concentrations within the limits of human tolerance. Furthermore, an increase in ozone concentration may not be perceptible and therefore health may be negatively affected. Ozone concentrations measured in urban areas are reported for different sites in and around Zurich. Comparisons are made with reported ozone concentrations from Los Angeles, Alpine resorts and Helsinki.

07842

Lewis, T. R., F. G. Hueter, and K. A. Busch

IRRADIATED AUTOMOBILE EXHAUST. (ITS EFFECTS ON THE REPRODUCTION OF MICE.) Arch. Environ. Health, 15(1):26-35, July 1967. 20 refs.

This study attempts to define the relative importance of pre-exposure of each member of the sexual pair to irradiated auto exhaust, and exposure of the female partner and her litter, following removal of the male with regard to conception, fetal development, fecundity, and infant survival. There were 150 virgin female mice preconditioned to either filtered air or irradiated automobile exhaust for 46 days, who were randomly paired with 150 similarly preconditioned males. All mice were 12 to 13 weeks of age at the time of mating and were caged individually during the preconditioning period. Males and females were paired randomly to form approximately equal numbers of sexual pairs (18 or 19) in each of eight treatment groups. The experiment was repeated with a new population of mice of the same strain 15 days after completion of the first investigation. The adverse effects of pre-conditioning male mice with irradiated auto exhaust on conception, implantation of fertilized ova, fecundity, and infant survival appear to be induced by a common mechanism. This is the first experiment the results of which imply mutational effects on mammalian cells by components or subsequent products of irradiated auto exhaust. An effect of the alteration of one environmental factor in this investigation, i.e. atmospheres to which the females were exposed, was evidenced by mild stress on litter sizes. Litters born in an atmosphere of irradiated auto exhaust showed a marked increase in mortality in both experiments, but the magnitude differed.##

07847

Coffin, D. L., E. J. Blommer, D. F. Gardner, and R. Holzman

EFFECT OF AIR POLLUTION ON ALTERATION OF SUSCEPTIBILITY TO PULMONARY INFECTION. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((18))p., ((1967)). 20 refs.

Exposure to ozone, nitrogen dioxide, and artifical auto smog increases the susceptibility of mice to experimental infection by K. pneumoniae, Streptococcus, and D. pneumoniae. Minimal effective concentrations for 2- to 4-hour exposure are: 3.5 ppm for NO2, 0.08 ppm for O3, and 0.15 total oxidant for auto smog. The effect appears to be augmented by alterations of the environmental temperature; tolerance to ozone is manifested. Continuous exposure to 0.5 ppm NO2 for 6 months produced similar results. Exposure to the pollutants results in increased survival time of aerosolized bacteria within the lungs, an effect also noted from treatment with cold, hypoxia, and alcohol. Studies of cells washed from the bronchial trees of rabbits

exposed to ozone indicate that exposure is followed by an influx of polymorphonuclear leukocytes and a corresponding diminution of pulmonary alveolar macrophages. The latter cells also exhibited a reduced ability to phagocytize streptococci when the organisms were applied in vivo. (Authors' abstract)##

07995

W. H. Parry

CHRONIC BRONCHITIS. A MAJOR HEALTH PROBLEM. Nursing Times, Vol. 61, p. 255-257, Feb. 19, 1965.

A review of chronic bronchitis in relation to causation, treatment and prevention is presented. The clinical disease, assessment of patients with bronchitis/emphysema, treatment, air pollution, smoke control areas, smoking and bronchitis, and health education are discussed.##

08021

C. J. Kensler, S. P. Battista

CHEMICAL AND PHYSICAL FACTORS AFFECTING MAMMALIAN CILIARY ACTIVITY. Am. Rev. Respirat. Diseases. 93(3):93-102, March 1966. 18 refs. (Presented at the Symposium on Structure, Function and Measurement of Respiratory Cilia, Duke Univ. Medical Center, Durham, N. C., Feb. 18-19, 1965.)

In studies on immersed tracheal preparations, optimal ciliary transport activity was observed when the temperature was maintained between 36 degrees C and 40 degrees C and the pH was between 6.5 and 8.5. Conditions outside these limits resulted in significant decreases in transport rate. A variety of neurohormones (cholinergic, adrenergic, serotonin, et cetera) have been found to produce slight increases (10-15 per cent) in transport rate at low concentrations and decreases at high concentrations (0.0001 M). No clear-cut evidence for neurohormonal control of mammalian ciliary transport activity has been obtained under experimental conditions in which possible effects on volume, composition, and physical properties of mucus have been minimized. A number of agents such as formic and acetic acids appeared to inhibit ciliary transport activity only a concenrations which altered the pH, so that alteration in pH would appear to be the primary factor involved in inhibition. Ciliary transport activity has been studied on tracheal preparations from rabbit, dog, cat, monkey, rat, and chicken. With the moist (air) chamber and tracer particles employed, all species exhibited transport rates of greater than 20 mm per minute and were similar in their response to the inhibitory effects of cigarette smoke. Gas-phase components of tobacco smoke, such as hydrogen cyanide, formaldehyde, and acrolein, but not phenol, appeared to be responsible for the bulk of the inhibitory activity of the total smoke. The removal of the gas-phase components by activated charcoal filters markedly reduced the ciliostatic activity of the total smoke. An examination of

reversibility of the inhibitory activity of a number of gas-phase components of cigarette smoke and air pollutants has shown that inhibition is rapidly reversed on termination of the exposure to some of these components, whereas recovery from others occurs less readily or not at all. The impingement of positively or negatively charged air ions produced by a tritium of polonium 210 radioactive source was without effect on ciliary transport activity. AS##

08026

MacEwen, James D. and Robert P. Geckler

COMPARATIVE TOXICITY STUDIES ON ANIMALS EXPOSED CONTINUOUSLY FOR PERIODS UP TO 90 DAYS TO NO2, O3% AND CC14 IN AMBIENT AIR VS. 5 PSIA 100% OXYGEN ATMOSPHERE. In: Proc. 2nd Ann. Conference Atmospheric Contamination in Confined Spaces, 4 and 5 May 1966, Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio, Aerospace Medical Div., AMRL-TR-66-120. p. 238-257, Dec. 1966. 6 refs.
CFSTI, DDC: AD 646512

The data obtained from a 90-day continuous exposure of animals to the industrial threshold limit value (TLV) of NO2, O3 and CC14 are presented. Animal exposure facilities of the Aerospace Medical Research Laboratories were used for the 90-day continuous experiments. The atmosphere compositions were 100% oxygen at 260 mm Hg pressure and air at either 820 (rho O2 = 154 mm Hg) or 740 mm Hg (rho O2 = 148 mm Hg) pressure. The data are unremarkable except for the deaths at 720 mm Hg pressure in the ozone exposures. Mice appear somewhat more sensitive to ozone than the other species. Guinea pigs also showed mortality upon exposure to ozone, which was the only material to which this species was exposed. Note that most of the deaths occurred during the first half of the 90-day exposure suggesting some degree of adaptation in the survivors. The data are consistent with the hypothesis that the animals first respond to the atmospheric contaminant and then adapt to the changed environment. The data do not, however, reveal significant differences between those animals exposed to contaminants at reduced pressure in 100% oxygen and those exposed at normal atmospheric pressure (740 mm Hg). With respect to the clinical data, although the values of serum enzymes of exposed animals were different from the control values, no adverse effects on the experimental animals were noted. It appears clear that the TLV for space applications may not be radically different from industrial TLV if only the factors of continuous dosage, reduced pressure, and pure oxygen atmosphere are considered.##

08027

Patrick, R. L.

PATHOLOGICAL EFFECTS OF EXPOSURE TO PULMONARY IRRITANTS AT AMBIENT AIR VS. 5 PSIA 100% OXYGEN ATMOSPHERE FOR PERIODS UP TO 90 DAYS. In: Proc. 2nd Ann. Conference Atmospheric Contamination Confined Spaces, 4 and 5 May 1966, Aerospace Medical Research Labs., Wright-Patterson

AFB, Ohio, Aerospace Medical Div., AMRL-TR-66-120, p. 260-262, Dec. 1966.
CFSTI, DDC: AD646512

A study to compare the toxic effects of contaminants under conditions of 5 psia (pounds per square inch, absolute) and 100% oxygen and under normal atmospheric conditions is described. Mortality and pathologic alterations were evaluated in monkeys, rats, and dogs exposed continuously to various concentrations of nitrogen dioxide and ozone for 14 days. Animals were exposed to these compounds, sacrificed, and examined grossly at the Toxic Hazards Research Unit. Tissues were sent to the Laboratory for Experimental Biology to be examined microscopically. All three species exposed to two concentrations of NO2 and ozone showed greater mortality at ambient conditions that at altitude. Animals dying early showed similar changes under both conditions. Survivors of each group showed similar changes except in isolated instances. Alveolar hemorrhage and edema were the most prominent changes associated with early death. It would seem that 5 psiz, 100% oxygen offered some degree of protection against alveolar hemorrhage and edema. In some groups inflammatory changes were more marked under altitude conditions; however, this is thought to reflect the longer survival of this group.##

08054

Gross, Paul, William E. Binehart, and Robert T. P. deTreville

THE PULMONARY REACTIONS TO TOXIC GASES. Am. Ind. Hyg. Assoc. J., 28(4):315-321, July-Aug. 1967. 8 refs. (Presented at the Annual Meeting, American Industrial Hygiene Assoc., Chicago, Ill., May 1-15, 1967.)

The deep pulmonary response to toxic gases depends upon which of the two components of the alveolar wall is responding, the capillary or the alveolar membrane. Injury to the capillary results in pulmonary edema or bronchopneumonia, whereas a dose of irritant injuring substantially only the alveolar membrane causes the latter to respond with the development of a multi-layered cell mass that is supported by argyrophilic fibers. Because collagenization of this stroma does not usually occur, such septal lesions caused by noxious gases resolve. The respiratory bronchiole is the site of predilection of lesions caused by deep lung irritants because of delayed clearance in this region. (Authors' abstract)##

08100

Gregory, Arthur R., Lyman A. Ripperton, and Bradford Miller

EFFECT OF NEONATAL THYMECTOMY ON THE DEVELOPMENT OF OZONE TOLERANCE IN MICE. Am. Ind. Hyg. Assoc. J., 28(3):278-282, May-June 1967. 16 refs. Presented at the American Industrial Hygiene Conference, Houston, Texas, May 3-7, 1967.

Male white Swiss mice, thymectomized at birth, were unable to develop tolerance to ozone when pre-exposed to sublethal concentrations of 0.3 and 5.0 ppm of ozone for one hour. On the other hand, tolerance was readily induced in sham-operated animals. Thus the thymus appears to be necessary during maturation for the development of tolerance to ozone. No statistical difference in mortality was shown between mice pre-exposed to 0.1 ppm. of ozone and those not so pre-exposed, despite the fact that a larger number of pre-exposed animals survived.

08151

Borisova, M. K.

EXPERIMENTAL DETERMINATION OF THE LIMIT OF ALLOWABLE CONCENTRATION OF DICHLORETHANE IN ATMOSPHERIC AIR. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 110-118, May 1960.
CFSTI: TT 60-21475

Data were obtained regarding the intensity and other characteristics of dichlorethane air pollution by industrial production and manufacturing plants; parallel with this some experimental data were secured regarding the effect of low dichlorethane concentrations on man. Chlorethan determinations were made by the microcombustion method in a gas analyzer. The results obtained for each plant investigated show that the average concentration ranged form 3.5 to 19.4 mg/cu m. The effect of low concentrations of dichlorethane on man was studied by the method of threshold of odor perception of dichlorethane by the adaptometer method and by the methods of plethysmography and spirography. Twelve test subjects sensed the odor of dichlorethane in 23.2 mg/cu m concentrations, 6 in 17.5 mg/cu m concentration and one each in 12.2 and 24.9 mg/cu m concentrations. The results of experiments indicate that a 6 mg/cu m concentration was the threshold concentration of dichlorethane affecting the functional state of the vision analyzer and of the vascular and respiratory reactions which was below the threshold concentration sensed by the olfactory organs in Russia that the limit of maximal single concentration of dichlorethane in atmospheric air should not exceed 4 mg/cu m.

08153

Izmerov, N. F.

HYGIENIC STANDARDIZATION OF THE LIMITS OF ALLOWABLE CONCENTRATIONS OF VAPORS OF GASOLINE IN ATMOSPHERIC AIR. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D.C., Inst. for Applied Tech., Vol. 3, p. 126-134, May 1960.
CFSTI: TT 60-21475

The physiological effects of low air concentrations of gasoline were studied. On the basis of the experimental results it can be concluded that the inhalation of gasoline vapors in 100 mg/cu m concentration under conditions of chronic exposure elicited in white rats clear cut changes in the higher nervous activity, the intensity of which increased with the duration of the exposures, and which disappeared only two weeks after exposure was discontinued. In the case of man the inhalation of gasoline vapors in concentration of 217 mg/ cu m for a brief period of time elicited reflex changes in the optical analyzer so far as sensitivity to light was concerned. The threshold of gasoline odor perception was considerably below the concentrations which elicited the previously noted changes in the functional state of the cerebral cortex; the odor perception threshold concentration was between 6.5 - 10.0 mg/cu m. It appears safe to conclude that the threshold of olfactory gasoline odor perception is the most sensitive index for the determination of limits of allowable concentrations of gasoline vapors in atmospheric air. It is proposed in Russia that a concentration of 5 mg/cu m calculated as C be adopted as the allowable limit of a single maximal concentration of the three grades of Groznensk gasoline investigated.

C8154

Melekhina, V. P.

MAXIMUM PERMISSIBLE CONCENTRATION OF FORMALDEHYDE IN ATMOSPHERIC AIR. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 135-140, May 1960.
CFSTI: TT 60-21475

The atmospheric air in the vicinity of the chemical plant under investigation was systematically polluted with formaldehyde, the concentration of which was as high as 0.04 mg/cu m even at a distance of 1000 meters from the plant. Investigations of atmospheric air polluted with formaldehyde caused by auto traffic and the exhaust of diesel propelled motor vehicles varied from 2 to 10 mg/cu m and 49 - 378 mg/cu m formaldehyde respectively. The threshold concentration of olfactory sensitivity to formaldehyde for the majority of persons under observation was 0.07 mg/cu m. A concentration of 0.05 mg/cu m was non-perceptible to most sensitive persons. The threshold formaldehyde concentration affecting reflex reaction as determined by the chronaxy method was 0.08 mg/cu m, and 0.07 mg/cu m was the subliminal concentration. The formaldehyde thresholed concentration of cortical reflex effect obtained by the adaptometric method rested in most sensitive persons at the level of C.098 mg/cu m. In studying the influence of small or low formaldehyde concentrations on man the method of determining threshold concentration of odor perception was the most sensitive, the result being 0.07 mg/cu m. Maximum permissible single formaldehyde concentration in atmospheric air should not exceed 0.035 mg/cu m.

08164

Plotnikova, M. M.

ACROLEIN AS AN ATMOSPHERIC AIR POLLUTANT. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 188-194, May 1960.
CFSTI: TT 60-21475

Atmospheric air pollution with acrolein discharged from a drying oil factory in Russia was determined colorimetrically. It extended as far as 100 meters from the source of pollution in concentrations exceeding the allowable limit. Its hygienic effects in different concentrations were studied. The threshold of olfactory acrolein perception for the majority of the test individuals was at 0.8 mg/cu m. The threshold of acrolein effect on the reflex reaction and on optical chronaxy was at 1.75 mg/cu m, and at 1.5 mg/cu m in the case of respiratory rhythm and wave amplitude. The threshold effect of acrolein on the functional state of the brain cortex as indicated by changes of reflex reaction and determined adaptometrically was established at 0.6 mg/cu m, which is below the threshold of acrolein odor perception. Tests indicated that 0.3 mg/cu m of acrolein can be taken as the limit of allowable maximal single concentration.

08234

DISCUSSION ON RESPIRATORY DISEASE AND POLLUTANT EXPOSURES. II. LABORATORY RELATIONSHIPS. Arch. Environ. Health, Vol. 8, p. 147-152, Jan. 1964.

A discussion on the laboratory relationships of respiratory disease and pollutant exposures is presented. Latex agglutination text in NO2 exposed animals, relationship between skin sensitivity and sensitivity of the bronchial mucosa, and mechanism of action in chronic lung disease are discussed.##

08238

DISCUSSION ON RESPIRATORY DISEASE AND POLLUTANT EXPOSURES. I. LABORATORY RELATIONSHIPS. Arch. Environ. Health, Vol. 8, p. 129-131, Jan. 1964.

A discussion on the laboratory relationships of respiratory disease and pollutant exposures is presented. The fate of the reabsorbed carbon in these animals exposed to inhalation of carbon alone, effects on circulation of exposure to NO2 plus carbon, differences in circulation with different sized carbon particles, mechanism material and the possibility of using carbons from different sources are discussed.

08243

Kotin, Paul, and Hans L. Falk

POLLUTED URBAN AIR AND RELATED ENVIRONMENTAL FACTORS IN THE PATHOGENESIS OF PULMONARY CANCER. Diseases Chest., 45(3):236-246, March 1964. 21 refs. (Presented at the 29th Annual Meeting, American College of Chest Physicians, Atlantic City, June 13-17, 1963.)

Data from several spheres of laboratory investigation lend support to the belief that the epidemiologic association between urban residence and lung cancer is of pathogenetic significance. Admittedly, the identification of carcinogenic agents in pollutant sources and in the atmosphere does not inevitably connote an adverse biologic effect. Nevertheless, the findings of the present investigation unite to form a constellation that strongly implicates the atmosphere as one dominant factor in the pathogenesis of lung cancer. The data are accorded additional significance by virtue of their congruity with the epidemiologic pattern of lung cancer. Epidemiologically, a reduction in lung cancer incidence may be properly anticipated as a result of reducing or eliminating the concentration of any of the environmental factors discussed. However, predictions as to the extent of reduction when but one of the factors is eliminated are meaningless in light of the multiplicity of factors described. It is wholly unwarrented to anticipate a quantitative reduction in lung cancer rates equal in number to the percentage showing a statistical association with any environmental source or specific carcinogenic agent. While atmospheric pollution is advanced as but one potential source of agents carcinogenic to the lung, proper evaluation of its contribution to the pathogenesis of lung cancer will be possible only in terms of its relation to the action of other significant environmental sources. ASM##

08276

M. C. Deleanu

CONTRIBUTIONS TO THE STUDY OF AIR IONIZATION AS AN ENVIRONMENTAL FACTOR AND ITS EFFECT ON THE BODY. ((Beitrage zum Studium der Luftionisation als Umweltfaktor und ihrer Wirkung auf den Organismus.)) Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 12(5):343-348, 1966. 15 refs.

The concentration of small ions with a mobility of 1 cm./sec.:V/cm. was determined daily in a relatively unpolluted area of Cluj, Romania from 1955-1964. A total of 2,025 measurements were taken, about 200 per year. The air ionization was relatively stable between 1955-1957, but increased 25% between 1957 and 1964, reaching a maximum between 1958-1959 due to atmospheric nuclear tests. In industrial centers, the small ion concentration of the atmosphere was considerably increased due to the fact that other fuels had been replaced by natural gas. The small ion density in rooms was determined; the concentration is closed, uninhabited rooms was higher than in the

open air, while the reverse was true of inhabited rooms with closed or open windows. The small ion density of inhabited rooms with cross-ventialation is equal to that of open air. As a measure of the effect of small ion concentration on the brain, liver, and kidney of chick embryos, the alkaline phosphatase and glycogen of these organs were determined. Moderate densities of small ions caused an increase, due to irritation of embryonic processes, while stronger ionic concentrations markedly decreased the amount of these substances in the organs, indicating serious ailments in the developing embryo. Feeding 0.3 gms. of cholesterol per kg. bodyweight per day to rabbits induced a spontaneous decrease in mobility. This effect was compensated by air ion therapy. These and other data in the literature indicate that the effects of air ions on the organism involve the nervous system. However some effects cannot be explained by this influence and it is postulated that air ions can influence different receptors and structures of the organism.##

08320

Shiota, K. A. Hamada, Y. Maeda, Y. Oka, M. Emura, K. Mitani, M. Matsuda, T. Inoue, M. Sawai, S. Kawamura, and M. Okubo

STUDIES ON CHRONIC BRONCHITIS IN OSAKA. Text in Japanese. Nippon Naika Gakkai Zasshi (Tokyo), 55(4):283-289, July 10, 1966. 20 refs.

A group of 68 cases (aged 45-65;F.E.V.1 less than 70%; and with no serious complicating illness) was selected from 218 respiratory clinic patients. The results were compared with those compiled by Fletcher and Burrow in London and Chicago. The Osaka patients included more professionals, and smoked more cigarettes per day. The severity and duration of respiratory symptoms, such as cough, sputum and subjective dyspnea were less severe and shorter in the Japanese patients. Climatic influence on respiratory symptoms was observed in the Osaka group during winter, and especially during days of smog (worst days, from October to March). Disabling due to acute pulmonary diseases was significantly different from that found in London; absenteeism was very rare. Other differences (ventilatory function) and similarities (in chest X-ray changes) between the two studies are discussed.##

08334

Campbell, Kirby I., George L. Clarke, L. Otis Emik, and Roger L. Plata

THE ATMOSPHERIC CONTAMINANT PEROXYACETYL NITRATE. ACUTE INHALATION TOXICITY IN MICE. Arch. Environ. Health, Vol. 15, p. 739-744, Dec. 1967. 19 refs.

Acute lethal toxicity of peroxyacetyl nitrate (PAN) expressed as median lethal concentration, or LC50, was estimated at 106 ppm.

Male A-strain mice were exposed for 2 hours and mortality was observed for 28 days. The potency of PAN is apparently much greater than that of sulfur dioxide, similar to that of nitrogen dioxide, and less than that of ozone. Median lethal exposures characteristically produced a delayed mortality pattern, most deaths occurring in the second and third week following exposure. Lethal toxicity was greater in older mice than in young mice, and at higher than at lower temperatures, but was not influenced appreciably by relative humidity. (Authors' summary, modified)##

08403

Hamming, Walter J. and Robert D. MacPhee

RELATIONSHIP OF NITROGEN OXIDES IN AUTO EXHAUST TO EYE IRRITATION--FURTHER RESULTS OF CHAMBER STUDIES. Atmos. Environ., 1(5):577-584, Sept. 1967 10 refs.

Two 1100 cu ft environmental chambers were utilized for irradiation of low concentrations of auto exhaust under static conditions. The chambers were constructed of glass panels with aluminum frames. Artificial lights were used. Eye irritation was determined by human panels at various times during the irradiations. Two irritation maxima occurred during a static test. The first peak has not been correlated with any functions of the reactants or products. However, the second eye irritation peak is shown in this paper to be related to several entities, among which is the NO^- defect. (Authors' abstract)##

08415

Lawther, P. J.

AIR POLLUTION, BRONCHITIS AND LUNG CANCER. Postgrad. Med. J. (London), Vol. 42, p. 703-708, Nov. 1966. 13 refs.

The emission of pollutants at levels close to the ground and during adverse meteorological conditions, such as temperature inversion, contribute to low altitude air pollution. Particulate matter in the air can be measured by optical and electron microscopy. An electron micrograph of common solid pollutants and a table showing the average and maximum winter concentrations of common gaseous pollutants in central London during 1954-1964 are provided. The results of various field and laboratory tests indicate that irritants in smoke, rather than SO2, were the causative agents for the exacerbation of existing chest diseases. While simple bronchitis may be caused by cigarette smoking, chronic bronchitis is related to urban factors. Tests further support the theory that the rise in the incidence of lung cancer is correlated with the incidence of cigarette smoking rather than with the level of polycyclic hydrocarbons in coal tar, coal smoke, and soot. Urban factors are also involved in the genesis of lung cancer. As a remedial measure it appears reasonable to recommend that fuel be burned centrally, and that the effluents be dispersed from tall stacks.##

08423

Gross, Paul, Robert T. P. deTreville, Mary A. Babyak, Marianne Kaschak, and Ethel B. Tolker

EXPERIMENTAL EMPHYSEMA. EFFECT OF CHRONIC NITROGEN DIOXIDE EXPOSURE AND PAPAIN ON NORMAL AND PNEUMOCONIOTIC LUNGS. Arch. Environ. Health, 16(1):51-58, Jan. 1968. 7 refs.

The extent to which pneumoconiosis may determine or affect the development of emphysema in small animals was investigated. Quartz, coal, and blast furnace dusts were injected intratracheally into hamsters, guinea pigs, and rats. One group of animals was pastured for two weeks and another group for 10 weeks. Animals from the latter group were injected intratracheally with papain. Both groups were then exposed for one year (two hours per day) to concentrations of nitrogen dioxide (NO_2) ranging on an average from 22 to 74 ppm. In guinea pigs this exposure resulted in multiple small foci of emphysema with a prevalence of only 15%. More animals without pneumoconiosis developed this emphysema than did animals with pneumoconiosis. Hamsters also develcped emphysema, but this is believed to have been spontaneous because more animals not exposed to NO_2 developed emphysema than those exposed. In the hamsters as in the guinea pigs, the emphysema was found predominantly in tissue unaffected by dust. Intratracheal injections of papain caused weight loss or reduction in weight gain in control animals. In pneumoconiotic animals, this effect of papain was less marked. Also, pneumoconiotic animals appeared to have less severe emphysema than the contrcl. Pneumoconiotic foci in lungs do not determine the location of emphysema whether experimentally produced (guinea pigs, rats, and hamsters) or naturally occurring (hamsters). Chronic exposures to NO_2 had no accelerating or collagenizing effect on experimental silicosis or on the pneumoconioses caused by ccal or blast furnace stack dust.##

08424

Hackney, Jack D., Bils, Robert F., Evans, Michael J., and Rounds, Donald E.

FUNCTIONAL AND MORPHOLOGICAL RESPONSE OF IN VITRO LUNG AND MYOCARDIAL TEST OBJECTS TO EXPERIMENTAL GAS ENVIRONMENTS. J. Air Pollution Control Assoc., 18(1):9-11, Jan. 1968. 7 refs. (Presented at the 60th Annual Meeting of the Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967.)

Innovations in the use of lung and myocardial tissue in vitro have permitted continuous morphological observation of cells treated with a controlled gaseous environment. The mammalian tissues are covered with a dialysis membrane and cultured in a Rose chamber containing a large gas phase. Test gases can be flushed continuously through two hypodermic needles in the culture chamber wall. Rabbit lung tissue was cultured in the Rose chamber and exposed to $NaNO_2$ concentrations which were adjusted to be

equivalent to NO2 gas. The use of NaNO2 was decided upon to facilitate the introduction of NO2 to the cells. Cell types could be recognized for 5 days or more in electron microscopic preparations. After 1 day of exposure to 40 ppm NO2, swelling and blebbing of the surface of the epithelial cells was seen; none was found in the control. More extensive involvement was apparent after 1-day exposure to 100 ppm, and after 3 days of exposure to40 PPM NO2. The beating rate of myocardial cells was found to be an objective and convenient endpoint for testing the characteristics of the exposure system. A comparison of the response of cells in the gas phase with that of elements in the fluid phase within the same chamber suggested that this system can serve as a model for evaluating the effect of an increasing diffusion barrier.

C8461

Il'nitskaya, A. V.

PROBLEMS OF OCCUPATIONAL HYGIENE AND HEALTH MEASURES IN PLASMA SPRAY-COATING OF METALS. ((Voprosy gigieny truda i ozdorovitelnye meropriyatiya pri plazmennom napylenii metallov.)) Text in Russian. Gigiena Truda i Prof. Zabolevaniya (Moscow), 10(7):21-27, July 1966. 7 refs.

Plasma spray coating of metals is accompanied by health hazards, such as high-frequency noise, the presence of aerosols, nitrous oxide, and ozone, as well as the ionization of air and ultraviolet radiation. The aerodynamic noise levels may attain 128-130 db. A special polyclinical and physiological examination of workers showed disturbed vascular tone with a tendency towards hypotension, slowed-down pulse and abnormal cardiac rhythm, as well as an increased threshold of auditory sensitivity by the end of the work day. Workers with a service record of 2-5 years exhibited impaired hearing with distorted perception of high-pitched tones. Recommendations are made for reducing the health hazards of operators. (Author's summary, modified)##

08499

Gualtierotti, R., and G. Ghini

ION AEROTHERAPY MODIFIES PULMONARY EDEMA RESULTING FROM OZONE. ((L'aercionoterapia modifica l'edema polmonare da ozono.)) Text in Italian. Arch. Med. Interna (Anselmi), 18(2):66-71, March-April 1966. 11 refs.

Results are compared for two groups of male white rats which were subjected to ozone intoxication. For 20 days before poisoning with ozone, one group was subjected for one hour daily to a stream of negative ions (measured by a galvanometer at a distance of 20 cm., 2 x 10 (to the 10th power) ions/sec.). Subsequent to exposure to ozone for 45 min., using a bell jar, two animals from each group were decapitated and examined. The relationship between the dry and wet weight of the lungs of each animal was analyzed. It was concluded that the negatively ionized air

significantly reduced the edematous infiltration into the lungs caused by inhaling ozone. The negative ions were shown to stimulate the endocrine system and improve the general metabolism of the organism, probably as a result of enhanced utilization of oxygen at the cellular level.##

08511

Anderson, Donald O.

THE EFFECTS OF AIR CONTAMINATION ON HEALTH: A REVIEW. PART II. Can. Med. Assoc. J. (Toronto), Vol. 97, p. 585-593, Sept. 9, 1967. 103 refs.

The literature on the health effects of specific pollutants is revieved. Included are studies on dustfall, sulfur dioxide, oxidizing pollution (as a mixture, or when broken into these components: carbon monoxide, oxides of nitrogen, ozone, and peroxyacetyl nitrate), polycyclic hydrocarbons, industrial sources of community air pollution (especially arsenic, beryllium, and asbestos), and several other pollutants. The effects of low levels of common air pollutants, classified as particulate matter, irritants, oxidants, and systemic poisons, are not known precisely. According to one study, high and significant correlations were obtained between lung cancer mortality in men, and levels of beryllium, arsenic, zinc, molybdenum, vanadium, cobalt, manganese, lead, and titanium. No correlation was observed for nickel and antimony. In terms of magnitude of the effect, the hazard of long-term exposure to levels of urban pollution is much less than that of personal air pollution by cigarette smoking. The biological effect, however, is similar to that of smoking, and is documented in excess mortality, respiratory conditions, and possibly also in respiratory cancer. The most important constituent currently measured in the air is dust.

08570

Boren, Hollis G.

PATHOBIOLOGY OF AIR POLLUTANTS. Environ. Res. 1(2):178-197 Oct 1967. 100 refs.

Results of inhalation exposures of guinea pigs to carbon followed by NO2, or to NO2 followed by carbon, are presented to exemplify both specific and general problems inherent in using animal systems to determine injurious effects of environmental agents. Inhalation of carbon alone is followed by a macrophage response. Subsequent exposure to NO2 results in lung destruction. Inhalation of NO2 followed by carbon gives a macrophage response of lesser degree. These findings are interpreted to mean that the sequence of exposure may determine a given response. The limitations of this study indicate the necessity of using approaches which control or measure multiple biologic factors operative at different levels of organization of diverse animal systems. (Author's abstract)

08646

Lloyd, D. H.

A NOTE ON FACTORY PROCESS SMELLS AND TOXIC HAZARDS. Sheet Metal Ind. (London), 44(481):311-318, May 1967.

Developments in manufacturing process mean the continual introduction of new chemicals, many of which have a characteristic and often powerful odour. This article discusses the effects of some of the toxic and odoriferous materials on the human body, their detection and the importance of adequate safeguards.

08668

Pryor, William H., Jr., Harold I. Bitter, and Raymond J. Bertler

THE EFFECT OF NITROGEN DIOXIDE-NITROGEN TETROXIDE ON OXYHEMOGLOBIN DISSOCIATION. School of Aerospace Medicine, Brooks AFB, Tex., Aerospace Medical Div., Task 630207, SAM-TR-67-33, p. 1-5, April 1967. 6 refs.
CFSTI: AD 655595

Twelve dogs were exposed to 180 parts per million nitrogen dioxide-nitrogen tetroxide until death occurred. Oxyhemoglobin dissociation curves were plotted on each subject before and after exposure. Percent saturation was thus used as a measure of ability to transport oxygen. It was determined that NO2/N2O4 exposure reduced the oxygen-carrying capacity of hemoglobin by 10 percent to 15 percent throughout the physiologic range. There was a rise in methemoglobin concentration that was not sufficient to account for the shift in the oxyhemoglobin dissociation curve, despite its being statistically significant. Although chronic exposures were not a part of this study, it is suggested that a similar reduction in hemoglobin function could result from long-term inhalation of air polluted with these gases. (Authors# abstract)

08801

Hogger, Dieter

EFFECTS OF THE MOTOR VEHICLE EXHAUST GASES ON HUMANS, ANIMALS AND PLANTS. ((Auswirkungen der Motorfahrzeugabgase auf Menschen, Tiere und Pflanzen.)) Text in German. Z. Praeventivmed., Vol. 11, p. 161-178, March-April, 1966. 20 refs.

The various toxic components in automobile exhaust gases are reviewed. To determine the amount of carbon monoxide inhaled by the population, the carbon monoxide hemoglobin content of 331 policemen and 597 automobile drivers was determined during a test for alcohol. The nonsmoking policemen did not exceed the 5% limit, but 25% of smoking policemen and 40% of the drivers did. The amount of lead in the street, in windowsill dust, and in the

street air was well as in the blood of office workers, metal workers and garage workers was determined in Zurich between 1948-1963. While the amount of lead in the dust of the street, air, and window sills increased significantly by 1955, the amount found in the blood increased only slightly. Soot is considered deleterious as a carrier of other water soluble toxic substances into the lungs. The hygienic limit of 0.5 cc./cu m for oxides of nitrogen is only seldom exceeded. Sulfur dioxide emissions are negligible. Hydrocarbons and polycyclic hydrocarbon emissions from motor vehicles contribute only a few percent to the rise in lung cancer. The paraffin and olefin hydrocarbons are nontoxic to humans, animals and plants, while ethylene is highly toxic to plants. While in Europe oxidants do not contribute significantly tc air pollution, compounds such as ozone and peroxyacylnitrite contribute to air pollution in tropic and subtropic climates with a high concentration of motor vehicle traffic, particularly under adverse meteorological conditions. The psychological problems caused by air pollution are discussed and it is concluded that the psychological effects cannot be dismissed lightly.##

08812

Muller, T. H.

AIR POLLUTION FROM AUTOMOTIVE EXHAUSTS. OBSERVATIONS IN BASEL. ((Die Verunreinigung der Atmosphare durch die Abgase der Motorfahrzeuge. Beobachtungen in Basel.)) Text in German Z. Praeventivmed., 11(2):157-160, March-April, 1966. 5 refs.

CO level was sampled in air taken from 8 areas of dense traffic during the period 1961-1964. Levels found ranged from 0 to 45 p.p.m., with occasional peaks to 90 p.p.m. These levels were about the same each year, in contrast to the sharp increase in the number of automobiles during that period. No conclusions are drawn from this observation, but the ambient air concentration of other exhaust gas components is pointed out as also significant. Averages are given for ammonia, SO2, NO2, and aldehyde. In order to clarify the possibility of eventual harm from lead additives in gasoline, urine samples from all traffic policemen were examined in 1965. There was no evidence of lead accumulation in any of the samples.##

08842

Krueger, A. P.

FINAL REPORT OF CONTRACT 3656 (06). California Univ., Berkeley, School of Public Health, Contract Nonr-3656(06), Proj. NR 102 587, 9p., 1967. 16 refs.
CFSTI: AD 660028

A final report of contract no. 3656(06) is presented. Two devices were designed to generate particular ion species in a selected gas. The first model was designed to operate with a gas flowrate of approximately 60 cc per min. Its experimental application was described by Kruegar, et al, (1964).

However, the need was apparent for a specific ion generator with a vastly reduced gas flowrate. Such a device was designed, fabricated and tested for gas flowrates as low as 5 cc per min and appears to have wide experimental applicability. Ion pairs are formed in a pure gas within a tritium-lined duct where ion separation is effected by the applied bias voltage. Unipolar ions are projected from the generator by the bias voltage and the moving air stream. A peripheral air supply acts as a carrier stream in addition to diluting the selected gas to normal levels. The instrument is capable of high unipolar ion production or the production of experimental atmospheres where both types of gaseous ions are present. A plexiglass exposure apparatus was developed. This equipment was designed to house small animals in experimental atmospheres modified only by the addition of selected gaseous ions to the slowly-moving and unobstructed air stream. A research summary includes: a. Study of the effects of gaseous ions on higher animals. b. Study of the effects of gaseous ions on the infectious process. c. Studies of the effects of air ions on protozoa. d. Studies of the effects of air ions on higher plants. e. Studies of the effects of air ions on insects.##

C8897

Felmeister, Alvin, Mohammad Amanat, and N. D. Weiner

INTERACTION OF NITROGEN DIOXIDE--OLEFIN GAS MIXTURES WITH LECITHIN MONOMOLECULAR FILMS. Environ. Sci. Technol., 2(1):40-43, Jan. 1968. 15 refs.

The interaction of nitrogen dioxide-olefin gas atmosphere with saturated lecithin monomolecular films were investigated using surface pressure measurements. Films of dipalmitoyl lecithin, a saturated phospholipide, showed no interaction with any of the test atmospheres used. Films of egg lecithin, an unsaturated phospholipide, showed significant changes in the surface pressure - surface area curves in the presence of all atmosphere containing nitrogen dioxide. The observed effects appear to be the result of a chemical interaction of NO2 with the double bonds of the egg lecithin rather than a simple physical penetration of the film. Biological implications are discussed. (Authors' abstract.)

08965

Veninga, Tjeerd Simon

TOXICITY OF OZONE IN COMPARISON WITH IONIZING RADIATION. Strahlentherapie (Munich), 134(3):469-477, Nov. 1967. 41 refs.

Exposure of living organisms to relatively low concentrations of ozone can lead to detrimental effects. C black mice were treated with 0.2 p.p.m. of ozone, for 7 hrs./d., 5 d./wk. during gestation and then for the first 3 weeks of life. Unlimited incisor growth rose from 0.9 percent in untreated newborn mice to 5.4% in the treated mice; neonatal death increased from 9 percent to 34 percent. Tabulated results show that frogs treated with 0.8 p.p.m. of ozone evince an increase in urine serotonin level.

Rabbits exposed to 0.2 p.p.m. of ozone for 60 min. showed a slight but significant drop in total blood serotonin immediately after termination of the ozone treatment. This drop must originate from a loss of plateletbound amine, since no alteration in free circulating plasma serotonin could be detected. Control rabbits demonstrated no significant modification of blood serotonin values. Ozone is considered radiomimetric, but ozone levels as low as 0.05 p.p.m., which is very close to observed natural values, with exposure to sublethal doses of X-rays one hr. later, lead to additive mortality rates in male mice.##

08997

Porter, J. K., S. Valdes, G. W. Schepers, Joaquin del Valle, and Gustavo Viniegra

RESPIRATORY AILMENTS FROM AIR POLLUTION. II. ANSWER TO PROLONGED EXPOSURE, CLINICAL PICTURE. ((Enfermedades respiratorias por contaminacion del aire. II. Respuesta a la contaminacion prolongada, cuadros clinicos.)) Text in Spanish. Neumol. Cir. Torax (Mexico), 28(6):395-403, Nov.-Dec. 1967.

Factors relevant to the medical effects of prolonged exposure to air pollution are discussed, followed by a summary of the clinical symptoms which result from such exposure. Individual susceptibility, the influence of previous exposures, smoking habits, allergic sensitization, and concomittant illnesses (bronchitis, emphysema, cancer) are mentioned. Air pollution crises which have occurred in the Meuse Valley, Donora, London, Yokohama, New Orleans, and Poza Rica are cited. Industrial smoke and motor vehicle exhausts are important agents in the production of respiratory diseases. If atmospheric pollution continues at its present rate of increase, human life will be impossible by the year 2000.##

09024

Fried, Josef and Dorothy E. Schumm

ONE ELECTRON TRANSFER OXIDATION OF 7,12-DIMETHYLBENZ(A) ANTHRACENE, A MODEL FOR THE METABOLIC ACTIVATION OF CARCINOGENIC HYDROCARBONS. J. Am. Chem. Soc., 89(21):5508-5509, Oct. 11, 1967. ((15)) refs.

In the study of carcinogenicity of polycyclic aromatic hydrocarbons, there is a basic question of whether it is the hydrocarbon itself of some metabolite produced in vivo that is the primary trigger for biological activity. A chemical model system is described which is converting the potent 7,12-dimethylbenz(a)anthracene (DMBA) into biologically more active products. The action of one electron transfer agents, manganese dioxide, ferricyanide and Ce(IV) on DMBA was investigated. Fractionation of the manganese dioxide products yielded in addition to DMBA, five compounds, which were identified with several procedures. The biological activity of each was investigated using an E. coli bacteria phage assay.##

09060

Ludwig, John H.

SOME RAMIFICATIONS OF AIR CONTAMINATION. Public Health Rept. (U.S.), 75(5):413-419, May 1960. 4 refs. (Presented at the 47th National Safety Congress and Exposition, Chicago, Ill., Oct. 20, 1959.)

The ramifications of air pollution are discussed in terms of health effects, urbanization, and economic losses. Particulates, benzo(a)pyrene, sulfur oxides and photochemically reactive species are discussed.##

09061

Jaffe, Louis S.

PHOTOCHEMICAL AIR POLLUTANTS AND THEIR EFFECTS ON MEN AND ANIMALS. II. ADVERSE EFFECTS. Arch. Environ. Health, Vol. 16, p. 241-255, Feb. 1968. 91 refs.

The literature related to recent findings on the adverse effects of photochemical smog on man and animals is reviewed. Recent studies on the effects of ozone and peroxyacyl nitrate (PAN) compounds, based on short-term and prolonged laboratory exposures to these individual oxidants are also presented. An understanding of the effects of these individual agents on man and animals in concentrations such as those found in community atmospheres contributes substantially to our knowledge of the effects of the ambient photochemical total oxidant mixture.##

09232

Rogala, H. and Malinowski, E.

A CASE OF NITROGEN OXIDE POISONING. ((Przypadek zatrucia tlenkami azotu.)) Text in Polish. Polish Tygod. Lekar. Wiadomosci Lekar. 23(1):18-19, Jan. 1968. 9 refs.

NO2 poisoning in a 34-yr.-old engineer is described. He was exposed for 30 min. to the yellow fumes generated in the fire of an ammonium nitrate storage facility. After treatment for a leg injury, he was returned home. Some 12 hrs. later he was delivered unconscious to the hospital, where he developed acute pulmonary edema. Symptoms and treatment are detailed. Recovery was complete and within one month. The need to organize a toxicological information center is emphasized in order to secure prompt treatment for similar cases.
Rogala, Henryk and Edward Malinowski

09239

Pavlik, I.

THE FATE OF LIGHT AIR IONS IN THE RESPIRATORY PATHWAYS.
Intern. J. Bioclimatol. Biometeorol. (Leiden), 11(2):175-185, July 1967. 10 refs.

Based upon the assumption that the mucosa of the respiratory tract are conductive surfaces with no electrical potential, equations are derived by which it is shown that light air ions (electrical mobility 2.0 sq. cm./v. sec.) will be deposited in the respiratory tract, being completely deposited between the intrasegmental bronchi and the bronchioles. The ions, according to the calculated results, will be deposited in great numbers in the nasal passages. Thus, all theories deriving the physiological action of air ions from their penetration into alveoli are not valid for light ions. Further study of the bioelectric potential of the mucosa in the upper respiratory tract, however, indicated that there is an electrical gradient, falling generally in the forward-backward direction. The highest negative potential was found regularly on the upper surface of the tongue, and the lowest negative potential, on the tonsils, the back walls of the pharynx, and the soft palate. The ability of this electric field to control the density of microbial flora on the mucosa was experimentally established in 15 cases. This natural electrostatic filter collects light ions upon the tongue, and especially during mouth breathing. An increase in the ion retention rate in the isthmus faucium, however, although quite high in comparison with the condition present in the theoretical absence of any electric field, does not radically change the deposition pattern in the rest of the respiratory tract.##

09241

Peacock, P. R. and J. E. Spence

INCIDENCE OF LUNG TUMOURS IN LX MICE EXPOSED TO (1) FREE RADICALS; (2) SO2. Brit. J. Cancer (London), 21(3):606-618, Sept. 1967. 4 refs.

Three groups of LX mice of both sexes were examined for primary lung tumors and other lesions: 50 untreated controls, 60 exposed to inhalation of free radicals; and 65 exposed to inhalation of 500 p.p.m. SO2 for 5 min. five days a week. No lung tumors were observed in mice below 300 days of age, so only those surviving this age are considered in assessing the tabulated results. The incidence of primary lung tumors in both sexes exposed to SO2 was almost doubled, compared with the controls; carcinoma of the lung in females was observed only in those mice exposed to SO2. There was a slight increase in lung tumors in both sexes exposed to free radicals. The incidence of hepatoma and lymphomatosis, the next most frequent tumors in the controls, was unaffected by the exposures to radicals or SO2. There was an association between persistent lymphatic

engorgement and alveolar hyperplasia and the development of progressive neoplasia, papillary adenoma and carcinoma in all groups. Repeated exposure to SO2 apparently accelerates the unexplained sequence of events which leads to the spontaneous growth of lung tumors in this strain. (Authors' summary, modified)##

09242

Pruller, P., and J. Reinet

LONG-TERM INVESTIGATIONS OF ATMOSPHERIC IONIZATION IN TARTU, ESTONIAN SSR. Intern. J. Bioclimatol. Biometeorol. (Leiden) 10 (2):127-133, Nov. 1966. 13 refs.

Density of positive and negative aerial ions was measured during 1951-1963, and correlated with meteorological measurements and the incidence of deaths and cardiovascular disease for 1960-1963. There is a seasonal variation, with a maximum density of small ions (ionic mobility greater than 0.1 sq. cm./v. sec.) from January to March and a minimum density from May to July; the density of large ions (ionic mobility less than 0.1 but greater than 0.00025 sq cm./v. sec.) varied inversely, with a maximum from May to July. Diurnal variation of the small ions was evident, with the small ions was evident, with the highest frequency after midnight and the lowest frequency at 7:00 A.M. The average density of small ions at 1:00 P.M. any day in the year was at a peak when the duration of sunshine was at least 60 percent of the possible daily sunshine. Natural aerial ion density is low compared with that of artificially ionized air or electro-aerosols. General mortality and incidence of cardiovascular diseases (angina pectoris, myocardial infarcts, thromboses and embolisms) are correlated with a low density of small ions and during the winter months. During a steep rise or fall of barometric pressure (64 times in 1960-1962), cardiovascular crises, angina pectoris and myocardial infarcts occurred more frequently than expected, with an excess of deaths.##

09244

Nasr, Ahmed N. M.

BIOCHEMICAL ASPECTS OF OZONE INTOXICATION: A REVIEW. J. Occupational Med., 9(12):589-597, Dec. 1967. 47 refs.

The physical and chemical properties of ozone, the effects of other oxidants with effects similar to those of ozone, and other characteristics of the action of ozone upon man and experimental animals are reviewed. Ozone is a highly reactive gas and when breathed, is unlikely to reach far beyond its port of entry. The main effect of ozone is thus on the respiratory tract, but other manifestations (drowsiness and headache) are probably secondary to its asphyxiant action. Mice exposed to 1 p.p.m. ozone exhibit depressed lung histamine for 25 days; ozone exposure also depresses glutathione content of the lungs, which can be prevented by inhalation of oil mist prior to exposure.

Animals also exhibit premature aging when exposed to ozone. The mechanism of action at the cellular and subcellular levels, while not clear, could be to interfere with the function of electron-transfer systems in biological oxidation, and with enzymes which require for their activity chemical groups that are readily oxidizable. High pressure oxygen may have a similar mode of action. Hydrogen peroxide is found, at levels of a few p.p.m., to enhance the toxicity of nonlethal levels of ozone or NO2. NO2 studies in animals and in vitro are mentioned, as are studies with peroxyacetyl nitrate (PAN). Vitamin C may play a protective role against the oxidizing effects of ozone or PAN, but the mechanism is unknown. Ozone has a radioiretric effect, as shown in studies with root tips and finger epidermis. Intermittent exercise, youth, alcohol, and respiratory infection are mentioned as augmenting the effects of ozone exposure. Prior intermittent exposure to ozone does not appear to protect animals against the chronic effects of bronchitis and bronchiolitis that follow continued exposure to ozone, although drugs (promethazine and aspirin) or thyroidectomy appear to enhance survival of animals exposed to lethal levels of ozone or ozone and NO2.##

C9368

Thomas, Heriberto V., Peter K. Mueller, and Richard L. Lyman

LIPOPEROXIDATION OF LUNG LIPIDS IN RATS EXPOSED TO NITROGEN DIOXIDE. Science, 159(3814):532-534, Feb. 2, 1968. 7 refs.

Absorption spectra characteristic of diene conjugation and typical for peroxidized polyenoic fatty acids can be induced in rat lung lipids after the rats have been exposed to a scant amount of nitrogen dioxide (1 part per million) for 4 hours. The peroxidative changes do not occur immediately but appear to reach a maximum between 24 and 48 hours after exposure. The peroxidant effect of this atmospheric pollutant in rat lung lipids may be partially prevented by prior treatment of the animal with large doses of alpha-tocopherol. (Authors' abstract)##

09412

Ranier, W. Gerald, David L. Kelble, James P. Newby, and M. Sanchez.

EXPERIMENTAL EMPHYSEMA. Ann. Thorac. Surg., 3(6):539-548, June 1967. 40 refs. (Presented at the 3rd Annual Meeting, Society of Thoracic Surgeons, Kansas City, Mo., Jan. 23-25, 1967.)

Chronic sublethal exposure to 75-125 ppm NO2 for 30-min. periods combined with selective expiratory airflow obstruction is investigated in the rabbit. Similar histological effects were produced by both the Venturi principle and aeronautical flow obstruction tubes. Mortality of the exposed animals was quite high. Of 53 rabbits exposed to NO2, only 21 survived 1-6 months after last exposure; of 62 animals with obstructive tubes only, 7 survived 1-6 months after surgery; of 41 rabbits undergoing both gas exposure and surgery, 14 survived 1-6 months. Exposed animals

exhibited diffuse alveolar destruction, with minimal fibrosis and reparative changes in the bronchiolar epithelium. There is a definite correlation between the lenght of the delay period prior to sacrifice and the degree of alveolar destruction, provided the animals were subjected to at least 20 NO2 exposures. Exposed rabbits with obstructive expiratory tubes developed expiratory wheezing, increased respiratory rates, and intolerance to even minimal exercise as delay pericds were lengthened.

09414

Orcutt, James A.

THE QUANTAL RESPONSE IN ENVIRONMENTAL TOXICOLOGY.
PART II. NORMALITY OF THE DISTRIBUTION OF QUANTAL MEASUREMENTS OF EYE IRRITATION OBTAINED IN DOWNTOWN LOS ANGELES. J. Am. Osteopath. Assoc., 66(12):1383-1385, Aug. 1967. 1 ref.

Data gathered half-hourly by county office workers on the presence or absence of eye irritation is grouped into ranges, and statistical analysis performed. The probit (normal deviate plus 5) percent incidence of eye irritation is shown to be both a normalizing and a linearizing statistical transformation (when correlated with log concentration of irritant). The probit percent eye irritation, among a representative sample of the population in response to Los Angeles air pollution, is thus found to be normally distributed.

09416

Orcutt, James A.

THE QUANTAL RESPONSE IN ENVIRONMENTAL TOXICOLOGY.
PART I. THE MEASUREMENT OF EYE IRRITATION AS A QUANTAL RESPONSE FOR CORRELATION WITH AEROMETRIC DATA FROM POLLUTED ATMOSPHERES. J. Am. Osteopath. Assoc., 66(12):1376-1383, Aug. 1967. 19 refs<

The correlation of human eye irritation with a specific, measured pollutant of the Los Angeles atmosphere (ether-soluble aerosols), as well as with measured concentrations of diluted, irradiated automobile exhausts in the laboratory, is demonstrated by a quantal procededure. When probit (normal deviate plus 5) percent incidence of eye irritation is plotted against log concentration, a straight line can be fitted in each case. Observed deviations from linearity were not statistically significant. The fallacies that might be encountered in presuming a causal relationship are discussed. This study serves mostly to illustrate the application of the quantal response to the quantitative evaluation of toxic, irritating effects of air pollution.

09440

McCarroll, James, Michael Lebowitz, Doris Wolter, Eric Cassell and Donovan Thompson

AIR POLLUTION AND ACUTE RESPIRATORY ILLNESS. Preprint, Washington Univ., Seattle, School of Medicine, ((28))p., 1967. (Presented at a joint meeting of the Pacific Northwest Section, American Industrial Hygiene Association and Northwest Association of Occupational Medicine, Portland, Oregon, Nov. 12, 1967.)

A three year study was conducted in New York City to determine what variations in the health of a normal urban population might be related to variations in their environment. The population studied included whites, Negroes, and Puerto Ricans from upper, middle, and lower income groups, and was divided into four categories: children (those under 15 years of age); adults; heavy cigarette smokers; and non-cigarette smokers. The total number of participants in the study was 1747 and each was observed for an average of 45 weeks. A questionnaire was developed containing approximately 120 items regarding variations in health. Each family was visited each week by a trained health interviewer who orally asked the questions in the questionnaire; questions were asked for each of the seven preceding days. An air pollution monitoring station was established in the center of the study area and measurements were made of SO2, particulates, carbon monoxide, and hydrocarbons. Also, monitoring records of a variety of other pollutants were obtained from the City. Continuous records were maintained on common meteorologic variables. The association between the daily prevalence rates of various health symptoms and the levels of air pollution are examined by several methods. The multiple correlation coefficients and the multiple regression coefficients of some of the symptom prevalence rates with air pollutants and meteorological factors are summarized. It is concluded that: a) there are associated relationships between symptoms in a normal urban population and a variety of environmental factors and b) no one factor, including air pollution, acts alone to produce most of the common illnesses.##

09565

Jaffe, L. S.

PHOTOCHEMICAL AIR POLLUTANTS AND THEIR EFFECTS ON MEN AND ANIMALS. II. ADVERSE EFFECTS. Arch. Environ. Health. Vol. 16, p. 241-255, Feb. 1968. 91 refs.

Recent findings on the biologically adverse effects of atmospheric photochemical smog on man and animals, using "total oxidant" as an index of this type of pollution are reviewed. Additionally, recent studies on the effects of ozone and peroxyacyl nitrate (PAN) compounds, important oxidants identified in photochemical smog, on man and animals based on short-term and prolonged laboratory exposures to these individual oxidants are also presented.##

09937

Britz, William E., John L. Steele, Charles E. Dasher, and August R. Banknieder

A DYNAMIC FLOW GASSING CHAMBER FOR TOXICOLOGY STUDIES WITH SPECIAL REFERENCE TO ITS USE WITH NO2. School of Aerospace Medicine, Brooks AFB, Texas, Aerospace Medicine Div., Proj. 6302, Task 630207, SAM-TRC-67-80, p. 12, Sept. 1967. 6 refs.

To test the toxicity of nitrogen dioxide / nitrogen tetroxide and other gases, it was necessary to construct an exposure chamber for small laboratory animals. This report describes the construction and operation of a small dynamic flow gassing chamber for studying toxic gas inhalation. Special attention is given to its use with NO2/N2O4 and the system for monitoring the concentration of gas. Several accessories for the chamber include a special harness for monitoring chest sounds of the subjects being gassed; a system for endotracheal intubation for allowing the subject to breathe the gas concentration while being manipulated surgically outside the chamber; and, a small "by-pass" chamber for small laboratory animal species being utilized in timed-dose studies. (Authors' abstract)

09958

Strandberg, Lars

CHANGES IN THE NO2-ABSORPTION OF THE RESPIRATORY TRACT WHEN EXPOSING RABBITS TO NO2 TOGETHER WITH CARBON PARTICLES. ((Forandrad NO2-absorbtion i luftvagarna hos kanin vid samtidig koldamtillforsel.)) Text in Swedish. Nord. Hyd. Tidskr. (Copenhagen), 48(1):8-12, 1967. 10 refs.

Groups of rabbits were exposed to NO2 (15-65 ppm). One group was exposed to NO2 without particles, another group to NO2 plus carbon particles (most particles over 0.25 micron. The third group was also exposed to NO2 plus carbon particles (most less than 0.25 micron. Gas absorption was then studied using a method previously described. Rabbits exposed to NO2 and Carbon particles absorbed more NO2 in the upper respiratory tract than the NO2-exposure group. Differences in the absorption pattern and the respiratory pattern when comparing the two carbon particle groups could also be observed. The changed NO2 absorption pattern in the presence of carbon particles may be the result of synergistic actions. (Author's summary, modified)

09994

Eils, Robert F.

ULTRASTRUCTURAL EFFECTS OF AIR POLLUTION ON LUNG CELLS. J. Air Pollution Control Assoc., 18(5):313-314, May 1968. 9 refs.

The lungs of exposed mice taken during 2- to 3-hour heavy smog periods (over 0.4 ppm total oxidants) showed various degrees of cytoplasmic damage in the alveolar epithelial cells. The extent of damage was markedly age-dependent. Alveolar walls cells taken during heavy smog from 5-month-old animals contained slightly more lamellar inclusion bodies than corresponding animals kept in clean air. The cytoplasm of alveolar cells of 9-month-old animals sacrificed during heavy smog was severely disorganized; however, animals of this age showed a marked recovery 14 hours following the smog peak. In a group of older mice (21 months), similar cytoplasmic damage was obvious, and those sacrified 24 hours after the heavy smog peak showed even more cellular disruption, suggesting irreversible damage in the older animals. The effect of synthetic photochemical smog showed a pattern of ultrastructural alterations similar to that of the heavy natural smog. Some permanent changes occurred in alveolar cells of 15-month-old mice. Partial recovery of lining cells took place, but few wall cells and phagocytes remained. If older lung tissue has relatively fewer wall cells as is indicated, recovery is decreased to the point of permanent damage. Coupled with extensive disruption of lining membranes, exposures of this nature may well cause the death of older animals. (Author's abstract)

10071

Lawson, W. H. Jr.

THE EFFECT OF TEMPERATURE AND PH ON THE RATE OF REACTION OF CARBON MONOXIDE AND OXYGEN WITH RED BLOOD CELLS IN NORMAL AND ANEMIC SUBJECTS, AND THE EFFECT OF HYPOXIA ON PULMONARY DIFFUSION OF CO IN NORMAL AND ANEMIC SUBJECTS. State Univ. of New York, Research Foundation, Contract DA-49-192-7:-2701, (6) p., 1965. 9 refs.
CFSTI, DDC: AD 623029

Investigations of the physiological adaptations and limitations of tissue oxygen delivery under streeses such as hypothermia, hypoxia, and exercise were made by studying in vitro measurements of red bloo cell-gas kinetics and in nine studies on effects of hypoxia on pulmonary circulation. Results of red-cell gas kinetics demonstrate that rates of oxygenation and deoxygenation were increased in microcytic hypochronic anemia but were unchanged in macrocytic and sickle-scell anemia. The rate carbon monoxide combines with oxygenated red cell was reduced with a decrease in temperature but was unaffected by changes in pH. Alterations in pulmonary capillary diffusion in acute hypoxia were demonstrated to be greater in anemic subjects than in normal subjects.

10390

A. Spinazzola, L. Marraccini

OZONE INTOXICATION - RECENT FINDINGS IN THE FIELDS OF PATHOLOGY AND PREVENTION. (Intossicazione da ozono. Recenti acquisizioni in tema di patologia e di prevenzione.) Text in Italian. Rass. Med. Sarda (Cagliari), 69(4):383-398, July-Aug. 1966. 30 refs.

Chemical characteristics of ozone, as well as sources of production, toxicology, pathology, diagnosis, therapy and prevention of ozone intoxication are reported. The most recent findings in this area of occupational medicine are stressed (including American research), and beginning with 1967. The increase in poisoning from ozone, especially at busy urban streets, leads to increased danger to drivers and passengers. Various laboratory tests now being studied are mentioned; none of these tests appears promising thus far. Continued study of the problem of ozone poisoning and of the control of ozone poisoning is recommended.**

10416

Domingo M. Aviado, and Harry Salem

ACUTE EFFECTS OF AIR POLLUTANTS ON THE LUNGS. Arch. Environ. Health, 16(6):903-907, June 1968. 38 refs.

The inhalation of chemicals initiates responses which can be grouped into four areas: (1) the airways which respond by bronchoconstriction to initiate the cough reflex; (2) the bronchial blood vessels which undergo changes to reduce absorption of the chemical substances via the bronchial mucosa; (3) the pulmonary blood vessels which respond to reduce absorption of the toxic irritants via the alveolar capillaries; and (4) the heart and systemic vessels which retard the distribution of the chemical substance to the vital organs. (Authors' abstract)**

10448
Smith, Ralph G.

AN ANALYST'S VIEW OF OUR POLLUTED PLANET. Anal. Chem., 40(7):24A-32A, June 1968.

The analysis of our environment in the interest of reducing pollution levels is a challenging and expanding activity that is attracting more analytical chemists as the field continues to expand. The natural skepticism of the analyst is badly needed as numbers all kinds tend to proliferate, even though standard methods are just now beginning to appear. The implications of threshold limit valu and ambient air quality standards are of such great consequence to society that every analyst should be most concerned with validity these numbers and their correct incorporation into laws. (Author' abstract)

10456

Wayne, Lowell G. and Leslie A. Chambers

BIOLOGICAL EFFECTS OF URBAN AIR P OLLUTION. Arch. Environ. Health, 16(6):871-885, June 1968. 14 refs.

Rodents exposed to the ambient atmosphere of Los Angeles throughout their lives have been studied in comparison with animals maintained in smog-filtered atmospherees. In aging inbred mice of certain strains, there was an increased incidence of pulmonary adenoma. In one strain mortality of males (but not females) during the first year of life was increased. Severe smog episodes caused lung tissue alterations at the ultrastructural level, especially in mice older than 15 months. Severe episodes produced transient increases in pulmonary resistance in old guinea pigs but no demonstrable chronic or cumulative effects on this parameter. In guinea pigs sensitized by prior stress treatment, urinary excretion of 17-ketogenic steroids was enhanced by ambient atmosphere exposure After two or three years of exposure, rabbits exhibited reduced activity of glutamic oxalcetic transaminase in blood serum. (Authors' abstract)

10490

Riddick, J. H. Jr. K. I. Campbell, and D. L. Coffin

THE EFFECTS OF CHRONIC NITROGEN DIOXIDE EXPOSURE ON DOGS: I. HISTAPATHOLCGY OF THE LUNG. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, (14)p., 1968. 17 refs.

The experiments reported were instituted to determine whether a larger species, the dog, would react similarly to nitrogen dioxide (NO_2). Results indicate that such exposure produces pulmonary emphysema and associated interstitial fibrosis, increased reticulum fibers, and elastic fibers. No significant regression of these lesions was apparent in two dogs examined 8 months after termination of exposure.

10492

Holzman, R.S., D. E. Gardner, and D. L. Coffin

IN VIVO INACTIVATION OF LYSONZYME BY OZONE. Preprint, Public Health Service, Cincinnati, Ohic, National Center for Air Control, 1968. (13)p., 17 refs.

Bronchial mucus contains large quantities of the antibacterial enzyme lysozyme. Acutely exposing mice or rabbits to ozone reduced the amount of active lysczyme ottainable by bronchopulmonary lavage. The effect was proportional to ozone concentration as well as to duration of exposure. Enzyme activity returned to normal levels during the 12 hours following exposure. Five parts per million ozon for 3 hours reduced lysczyme levels approximately 30 percent. Studies of the release of lysozyme by alveolar cells support the theory that loss of activity is due to in vivo oxidation of lysozyme (Authors' abstract)

10514

Gregory, Kenton L., Victoria F. Malinoski, and Charles P. Sharp

CLEVELAND CLINIC FIRE SURVIVORSHIP STUDY 1929-1965. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, (22)p., July 22, 1968. 7 refs. (Presented at th 9th American Medical Association Air Pollution Medical Research Conference, Denver, Colorado, July 22-24, 1968.)

A long-term study was conducted to determine if there was an effect on the mortality experience of persons exposed to gases, such as HCN, CO, and NO, produced by the decomposition of nitrocellulose ray film. Such exposure occurred in a fire at the Cleveland Clinic, Cleveland, Ohio on May 15, 1929. Information was gathered concernin the 1965 survival status of all persons who were in the building or who helped with the rescue efforts. These data were categorized by exposed and unexposed groups and were analysed by modified life tabl methods. The results of these analyses and the problems incurred in this type of study are presented. (Author's abstract, modified)

10611

Bernard D. Goldstein, Charlotte Lodi, Charlotte Collinson, and Oscar J. Balchum

OZONE AND LIPID PEROXIDATION. Preprint, University of Southern California, Los Angeles, School of Medicine and Los Angeles County General Hospital, Calif., 11p., 1968. (Presented at the American Medical Association Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Paper 3.)

Lung lipid extracts of mice exposed to 0.4 0.7 ppm ozone for four hours demonstrated ultraviolet absorption patterns consistent with the formation of lipid peroxides. The attendant UFA breakdown would lead to the formation of free radicals and other intermediates capable of causing cellular injury. Similar reactions with the carbon double bond of UFA can also be instigated by free radicals or by oxygen in an entity known as lipid peroxidation. It is therefore conceivable that the breakdown of UFA and the production of free radicals could be initiated either by direct ozonolysis or by free radicals derived from another ozone reaction. Significantly decreased ert
erythrocyte enzyme acetylcholinesterase (AChE) activity was also found in mice exposed to toxic levels of ozone in vivo. In this same experiment there was only a slight depression in mouse erythrocyte intracellular -SH which was not statistically significant. Signs of early aging in animals chronically exposed to ozone is of interest in regards to a hypothetical role of ozone in producting lipid peroxidation. Ozone concentrations present in urban areas can produce lipid peroxidation.##

10613

Anthony A. Thomas

SPACE CABIN TOXICOLOGY. In: NASA, Marshall Space Flight Center 5th Annual Meeting, Air Force Systems Command, Wright-Patterson AFB, Ohio, p. 207-217, March 3, 1967. 18 refs.
NASA: N68-17369

Space cabin toxicology is a new and challenging area of research in life support. The unique problem of this branch of toxicology is the truly uninterrupted continuous nature of exposure to chemical toxicants. Fundamental research in the last two years has answered the following most urgent basic questions. Continuous exposure can lead to a "summation of interest" type of toxic effect because daily recuperative periods from exposure are non-existent. The exotic atmospheric environment can influence the outcome of toxic damage; reduced barometric pressure and oxygen-rich atmosphere are influencing factors. All cabin materials can and must be screened by analytical and biological methods to increase the health and performance of the crew in future manned space missions. To answer these questions, experiments were conducted with animals in controlled atmosphere chambers at reduced pressure. Various contaminant materials were introduced for long exposures times. The tests themselves lasted up to eight months, thus giving a good indication of the effects of long-term exposure to a "space cabin" atmosphere.##

10623

M. E. Eglite

A CONTRIBUTION TO THE HYGIENIC ASSESSMENT OF ATMOSPHERIC OZONE. ((K voprosu o gigienicheskoi otsenke atmosfernogo ozona.)) Hyg. & Sanit. (English translation of: Gigiena i Sanit.), 33(1-3):18-23, Jan.-March 1968. 13 refs.
CFSTI: T 68-50449/1

The toxic effect of ozone on man and animals affects the respiratory organs and the central nervous system, and less frequently the cardiovascular system, the basal metabolism and the functioning of the liver. The atmospheric concentration of ozone in large industrial cities in the Soviet Union was studied and health implications were assessed. In experiments, animals inspired ozone in a concentration of 0.2 mg/cu.m. for 6 hr. The experiments were carred out 268 times over a period of 433 days. Most of the animals developed chronic bronchitis, bronchiolitis and emphysema. In addition to pulmonary changes, the animals exhibited a decrease of lipoids in the suprarenal cortex. The effects of low ozone concentrations on man were studied by determinations of its olfactory threshold and its effects upon electrical activity of the cerebral cortex. The olfactory threshold of ozone was found to be 0.015mg/cu.m., and with respect to effect on electrical activity of cerebral cortex, the concentration was 0.005 mg/cu.m.##

10670

Goldsmith, John R. and Jay A. Nadel

EXPERIMENTAL EXPOSURE OF HUMAN SUBJECTS TO OZONE. Preprint, California Dept. of Public Health, Berkeley, Environmental Hazards Evaluation Unit and California Univ. Medical Center, San Francisco, Cardiovascular Research Inst., 6p., 1968. 8 refs. (Presented at the Air Pollution Control Association Meeting, St. Paul, Minn., June 23-28, 1968, Paper 68-126.)

Four presumably healthy male subjects were exposed for one hour to ozone at 0.1, 0.4, 0.6 and 1.0 ppm. Airway resistance increased slightly but significantly after exposure in two subjects at the lowest concentration, in one each at the two intermediate concentrations and in all four at 1.0 ppm. The increases were physiologically small and generally less than those in normal subjects inhaling the smoke from a single cigarette. (Authors' abstract) ##

10685

Bils, Robert F. and Michael J. Evans

THE EFFECTS OF OZONE, NITROGEN DIOXIDE AND OTHER GASEOUS AIR POLLUTANTS ON MAMMALIAN RESPIRATORY TISSUES -- A REVIEW OF LIGHT AND ELECTRON MICROSCOPE STUDIES. Preprint, Allan Hancock Foundation and University of Southern California, Los Angeles, Dept. of Biological Sciences, 20p., 1968. ((49)) refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-83.)

Morphological changes associated with the toxicity of ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide and other gaseous air pollutants are reported. Microscopical investigations have been made using concentrations of ozone ranging from 0.2 to 50 ppm on mice, rats, hamsters, rabbits, and dogs. Methods of exposure varied from single doses for 1 to 6 hours, to multiple or continuous doses for up to 433 days. Morphological changes seen with the light microscope after a single dose are accumulation of edema fluid and migration of leukocytes into the alveolar space. Electron microscopy has revealed swelling and rupture of endothelial and epithelial cells and accumulation of cell debris in the alveoli. In prolonged studies chronic pneumonitis and contracted alveolar septa are seen. The effects of nitrogen dioxide on mammals are seen mostly in the respiratory tract. Experimental exposures as high as 400 ppm cause bronchopneumonia and death within minutes in laboratory animals. At 40-80 ppm severe ultrastructural alterations were seen in middle-aged mice exposed to NO2 for about 1 hour. The same age animals exposed for 24 hours at 25 ppm showed slight damage to lung lining membranes. A similar effect was produced at 15 ppm for four hours each day for six weeks, but such changes are easily reversible. Very slight histopathology is evident with levels in the 0.5-5 ppm range continuously for 12 months or more. Sulfur

dioxide produces little or no morphologic change in lungs even with daily exposures of 25-50 ppm for a month. Severe ultrastructural damage to the lungs has been reported after 15-30 minutes of 0.5-1.0% carbon monoxide. Natural Los Angeles smog affected mouse lungs much like the ozone at 1.3 ppm.##

10752

Hore, Terry and David E. Gibson

OZONE EXPOSURE AND INTELLIGENCE TESTS. Arch. Environ. Health, 17(1):77-79, July 1968.

The effect of ozone on mental functioning was studied by administering intelligence tests to 99 university students. The subjects were divided into treatment (exposed to 0.2 to 0.3 ppm ozone during the writing of the test), placebo, and control (not exposed to ozone) groups. After statistical adjustment had been made for the effects of the covariants (age, sex, anxiety, and initial intelligence test score) no significant difference was found between the groups. This study indicated that exposure to concentrations of 0.2 to 0.3 ppm ozone over a period of 70 minutes had no noticeable effect on mental functioning during the exposure period. (Authors' abstract)##

10731

Anon.

COMMUNITY AIR QUALITY GUIDES. OZONE (PHOTOCHEMICAL OXIDANT). Am. Ind. Hyg. Assoc. J., 29(3):299-303, May-June 1968.

The effects of ozone on humans, plants, and animals at various concentrations are reviewed. A maximum allowable concentration in the range of 0.01 to 0.10 ppm is recommended, depending on the length of exposure and on the species to be exposed.##

107787

Truche, M. P.

THE TOXICITY OF OZONE. (La toxicite de l'ozone.) Translated from French. Arch. Maladies Profess. Med. Trav. Securite Sociale (Paris), 12(1):55-58, Jan. - Feb. 1951.

The characteristic odor of ozone is noticeable about 1 p.p.m. below 4 p.p.m., ozone induces non-symptomatic effects, such as a 10 -20% drop in basal metabolism, reduced pulse rate and marked drop in arterial blood pressure in hypertensives (not in young persons or in hypotensives). At higher, symptomatic levels, the characteritic symptoms appear: substernal pressure, or a feeling of oppression, but no irritation of the mucous membranes. The oppressive feeling

disappears as soon as the ozone level drops below 4 p.p.m. Symptoms of the higher irritant, but non-toxic levels are: cough, itching of the nose and throat, aggravation of symptoms by tobacco smoke, and general mucosal irritation. This irritation and sore throat may persist for several days. One source believes that ozone is non-toxic to man in levels up to 1,000 ppm for a short period, or 20 ppm for long periods of exposure. Occupational examples of irritation by ozone are mentioned, specifically in a test laboratory of a factory for electronic insulators.

10779T

Henschler, D. and W. Laux

ON THE SPECIFICITY OF THE TOLERANCE INCREASE UPON REPEATED INHALATION OF GASES THAT PRODUCE PULMONARY EDEMA. (Zur Spezifitat einer Toleranzsteigerung bei wiederholter Einatmung von Lungenodem erzeugenden Gasen.) Translated from German. Arch. Exp. Pathol. Pharmakol., 239(5):433-441, 1960. 16 refs.

Sub-lethal doses of irritant gases will protect against the formation of lethal pulmonary edema upon subsequent inhalation of highly toxic levels. Groups of 20 Wistar rats each were pre-treated for 6 hr. with low levels of phosgene (1 ppm), NO2 (20-40 ppm), or ozone (1.6-20 ppm) and four days later were exposed for a half-hour to lethal levels of one of the three gases. Survival rate, survival time, and relative lung weights are used as criteria of protective effects for the pre-treated animals and for the controls. Ozone protects against subsequent ozone exposure, and also slightly against subsequent NO2 or phosgene exposure. NO2 protects against itself and ozone; pre-treatment with Phosgene produces the relatively most powerful tolerance increases, specifically, and in ascending order, to phosgene, , and NOi. Pre-treatment with NO2 is without any definite effect on phosgene poisoning. Since the protective effects are thus not specific for one kind of gas, an antigen-antibody reaction is ruled out. The large variations in degree and duration of the protection give rise to the belief that several unknown processes are involved.##

10780T

Schulz, Hugo

CHRONIC OZONE POISONING. (Ueber chronische Ozonvergiftung.) Translated from German. Arch. Exp. Pathol. Pharmakol., 29(5-6):364-385, 1892. 6 refs.

Either separately or in pairs, a total of 3 rabbits, 5 cats, and 6 dogs were exposed repeatedly to ozone for 1-2 hours at a time. The bell-jar apparatus used for exposure is described. Ozone concentrations were not determined, but some of the rubber hosing was repeatedly eaten away. The animals died after totals of 2-62 hr. exposure over periods of several days. Autopsy details are given. Descriptive details are also given of behavior and symptoms observed while exposed to the ozone.##

10790T

Passleer, R.

CONTRIBUTION TO THE STUDY OF THE INTOXICATION BY OZONE. ((Contribution a l'etude de l'intoxication par l'ozone.)) Translated from French. Acta Belg. Arte Med. Pharm. Mil. 4(2): 253-269, June 1958.
1958.

Experiments where white rats (300 gm) were exposed to the acutely toxic level of 60 ppm indicate that ozone produces major changes in the alveoli. Effects on cardiac and respiratory rhythms and on hemoglobin saturation are graphed. Survival times was about 5 hr. The effects of numbutol, morphine, largactil, lobeline, adrenaline, and digitalis are also noted. The many characteristics common to poisoning with ozone and with oxygen lead to the conclusion that an identical mechanism involved in both events.

10791T

Henschler, D., A. Stier, H. Beck and W. Neumann

OLFACTORY THRESHOLD OF SOME IMPORTANT IRRITANT GASES (SULFUR DIOXIDE, OZONE, NITROGEN DIOXIDE) AND MANIFESTATION IN MAN BY LOW CONCENTRATIONS. ((Geruchsschwellen einiger wichtiger Reizgase (Schwefeldioxyd, Ozon, Stickstoffdioxyd) und Erscheinungen bei der Einwirkung geringer Konzentrationen auf den Menschen.)) Translated from German. Arch. Gewerbepathol. Gewerbehyg., 17(6):547-570, March 1960. 46 refs.

A 8 cu m exposure chamber and auxiliary equipment are described for use in exposure experiments. After a review of the effects of low levels of SO2, nitrogen oxides, and O3 on human beings, work is described using groups of 10-14 male volunteers. SO2 was smelled and/or tasted by subjects at 0.5 ppm, by 75% at 1.0 ppm, and by all at 2.5 ppm; 5 ppm reproduced cough and irritation. The initial odor slowly changes into a sensation of flavor. Increased humidity has no effect on the sensations. The olfactory threshold lies below the lowest tested concentration of 0.02 ppm. Odor perception diminished rapidly and 0.5-12.0 min. exposure to O3 no longer led to an olfactory perception. Increased humidity also has no effect on perception. NO2 is smelled by some at 0.1 ppm, and by all at 0.4 ppm. The olfactory sensation disappears upon continued inhalation of higher levels (up to 20 ppm) for several minutes. Local irritations appeared during initial exposure to NO2, but subsequent exposures led to rapid adjustment. Increased humidity with 1 ppm NO2 increases the number of irritant symptoms. A rapid increase in the threshold of perception to relatively strong NO2 levels is observed. Results, including subjective effects, are tabulated.##

10792I

Flury, Ferdinand and Franz Zernik

NOXIOUS GASES, FUMES, VAPORS, FOG, AND VARIETIES OF SMOKE AND DUST: OZONE. ((Schaedliche Gase, Daempfe, Nebel, Rauch- und Staubarten: Ozone.)) Translated from German. Berlin, Julius Springer, 1931, p. 115-116. 14 refs.

The chemical properties of O3 are described. Based on the literature, the symptoms of acute and chronic poisoning are summarized for animals and man. Death usually occurs from pulmonary edema, usually with convulsions. In man, brief inhalation of 5-10 ppm leads to accelerated pulse, sleepiness, and lasting headaches.##

10970

G. Freeman, R. J. Stephens, S. C. Crane, M. J. Furiosi

LESION OF THE LUNG IN RATS CONTINUOUSLY EXPOSED TO TWO PARTS PER MILLION OF NITROGEN DIOXIDE. Arch. Environ. Health, 17(2):181-192, Aug. 1968.

Rats exposed continuously to 2 ppm of nitrogen dioxide in air survived their ordinary lifetimes with persistent tachypnoea and usually died of nonpulmonary diseases. Resistance to airflow and dynamic compliance were not different from those in controls. Terminal and respiratory bronchiolar epithelium was affected mainly by a loss of exfoliative activity, reduced blebbing of cytoplasm into the airways, reduction in or loss of cilia, and the appearance of rod-shaped intracytoplasmic crystalloid inclusions. Morphologic evidence suggests that rats exposed to 2ppm would have reduced cleansing function of the periphery of the lung. Pulmonary tissue was embedded in plastic and sections were cut at 1 micron for light microscopy and thinner sections for electron microscopy.##

11045

I. S. Jaffe

ARE AMBIENT LEVELS OF OXIDANTS HAZARDOUS TO BIOLOGICAL SYSTEMS. Preprint, Public Health Service, Arlington, Va., National Air Pollution Control Administration, ((21))p., 1968. 47 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-58.)

When concentrations of photochemical oxidants are used as measures of photochemical smog intensity, a number of specific biological effects on man and animal based on both atmospheric and laboratory studies have been documented. Photochemical

oxidants, such as routinely found in urban communities as measured by continuous air monitoring instruments used by federal, state, and local agencies, cause a repeated and continuing biological impact on man and animals in every region of the country. The degree and types of the documented biological effects are dependent on the local community atmospheric level attained and the frequency of occurrence. The results of many studies are included and discussed. (Author's summary, modified)##

11241

E. M. Roth, W. H. Teichner, and A. O. Mirarchi

CONTAMINANTS STANDARDS. (SECTION 13.) In: Compendium of Human Responses to the Aerospace Environment, Volume III, Sections 10-16, Emanuel M. Roth (ed.), Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., CONTRACT NAS-115, p. 1-115, Nov. 1968. 233 refs.
CFSTI: NASA CR-1205(III

Toxicological problems in space operations cover three situations: (1) the acute, short term, high-level exposure either in ground support or space cabin conditions; (2) the 8-hour work day exposure found in manufacturing and ground support situations; and (3) continuous, long term exposure to trace contaminants, such as would be anticipated in extended space missions. In view of the necessity for provisional limits of manned space flights of 90 to 1000 days duration the following criteria for trace contaminant control in manned spacecraft have been derived: Contaminants must not produce significant adverse changes in the physiological, biochemical, or mental stability of the crew. The spacecraft environment must not contribute to a performance decrement of the crew that will endanger mission objectives. The spacecraft environment must not interfere with physical or biological experiments nor with medical monitoring. Based on these criteria air quality standards for prolonged manned missions have been established. The following topics are discussed: kinetics of contaminants in space cabins; toxicological factors; toxicology in the spacecraft environment; source of contaminants; particulates and aerosols; microbial contaminants. Tables presenting chemical analysis of all contaminants with standard levels for space cabins are listed.##

11297

Buckley, Ramon D. and Clayton G. Loosli

EFFECTS OF NO2 INHALATION ON GERMFREE MOUSE LUNG. Preprint, University of Southern California, Los Angeles, School of Medicine, 19p., 1968. 17 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session IV: Animal Toxicology, Paper 3.)

Structural and metabolic responses of germfree and gnotobiotic mouse lung to nitrogen dioxide were studied. The course of

respiratory infection in mice mono-contaminated via aerosol clauds of bacteria or virus was also determined. Histological observations showed that germfree mice exposed continuously to NC2 developed changes in the bronchial epithelium. Tissue localization and relative activity of lactic dehydrogenase (LDH) acid and alkaline phosphatase enzymes were used to study alterations in lung metabolism induced by NO2 at the cellular level. The lungs of NO2 exposed mice showed intense LDH activity. The results of oxygen consumption studies on lung slices of NO2 exposed germfree mice showed a significant increase in oxygen consumption after 15 min. incubation and from each time internal thereafter. The lung clearance rate of germfree NO2 exposed mice to bacteria was not impaired. Studies indicated that germfree control and NO2 exposed animals responded similar to virus infection.##

11306

Henry, Mary C., Richard Ehrlich, and William H. Blair

EFFECT OF NO2 ON RESISTANCE OF SQUIRREL MONKEYS TO K. PNEUMONIAE INFECTION. Preprint, ((22)) p., 1968. 9 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session IV: Animal Toxicology, Paper 2.)

There is an effect of nitrogen dioxide on the resistance to respiratory infection in monkeys. Exposure to nitrogen dioxide may permit better colonization of bacteria in the lungs of monkeys by inhibition of the mechanism of bacterial clearance from lungs and thus resulting in increased mortality.##

11307

Emik, L.O. and R.L. Plata

DEPRESSION OF RUNNING ACTIVITY IN MICE BY EXPOSURE TO POLLUTED AIR. Preprint, California Univ., Riverside, Statewide Air Pollution Research Center, 12p., 1968. 6 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session IV: Animal Toxicology, Paper 1.)

Mice in activity wheels were exposed continuously to diluted raw or irradiated and unirradiated auto exhaust for a period of 8 weeks, using a diurnal cycle simulating Los Angeles conditions in heavy smog. Those in irradiated exhaust showed an immediate depression greater than those in raw exhaust, each gradually recovering and finally surpassing the controls by the end of the experiment. A balanced half each of control and irradiated exhaust groups was switched to the other exposure for the second 4 weeks. The controls later placed into irradiated exhaust ran significantly less than any other group. On a daily basis, no significant treatment effects were found although the LAF males always ran significantly (P less than .01) farther than their BALB chamber mates. The exhaust atmospheres appeared to modify

the diurnal cycles of activity, generally flattening the usual night peak, but no detailed analyses were made. The mice exposed to ozonized gasoline fumes gradually recovered their control level of activity when continually exposed for several weeks. With this background of experience, mouse activity was included as one measure of the effects of ambient air pollution exposure.##

11308

Freeman, Gustave

THE SUB-ACUTE NO2 LESION OF THE RAT LUNG. Preprint, Stanford Research Inst., Menlo Park, Calif., Dept. of Medical Sciences, 5p., 1968. 9 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968. Session IV: Animal Toxicology, Paper 6.)

Two main issues were explored in studies with NO2 in rats. One was the highest level of NO2 in ambient air that would not acutely injure the respiratory tract, and the other was the contribution NO2 might make in the pathogenesis of pulmonary emphysema in man. Investigations were limited to concentrations below which NO2 could incite acute effects such as edema, destruction of cells, and inflammatory reaction in the lung. Rats grew normally and survived natural lifetimes in an atmosphere containing the realistic concentration of 0.8 plus or minus 0.2 ppm NO2, but they consistently exhibited a moderate degree of tachypnoea without apparent distress. A similar series was exposed to 2 plus or minus 1 ppm, with similar results. In both cases, the lungs appeared grossly normal and contracted on exposure to the atmosphere. Microscopically, however, sections revealed changes of the terminal bronchiolar epithelium in the latter group that were seen only rarely in the 0.8 plus or minus 0.2 ppm group but not in controls. The development of emphysema-like lungs was accompanied by enlargement of the thoracic cage, with dorsal dyphosis. The unrelenting effect of continuous NO2 might not allow time for much pulmonary tissue to be destroyed before death but this might occur with somewhat less persistent exposures.##

11331

T.D. Sterling

MEASURING THE EFFECT OF AIR POLLUTION ON URBAN MORBIDITY. Preprint, Washington Univ., St. Louis, Mo., Dept. of Applied Mathematics and Computer Science, 19p., 1968. 6 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session I: Problem Formulation and Analysis, Paper 4.)

The relationship between hospital morbidity and day to day pollution was analyzed. Results were given for relevant disease which were giben for relevant diseases which were given for relevant diseases which were allergic disorders, inflammatory diseases of the eye, upper respiratory infection,

influenza, bronchitis, diseases of the heat, rheumatic fever and muscular diseases. The pollutants used were oxidant, CO2, SO2, NO2, NO, O3, oxidant precursor, and particulate matter. A pattern was apparent by which pollution affects diseases with strong respiratory or circulatory components with allergies. The differences between the effects of different pollutants were less important, since each one of the pollution measurements was a general index of pollution rather than specific for a particular effective contact chemical. Correlation between pollutants and relevant diseases were in general positive. They were highest for oxidants, sulfur dioxide, nitrogen dioxide, and ozone. There were significant correlations between length of hospital stay in regards to relevant diseases and pollution.##

11335

H. K. Ury, A. C. Hexter

STATISTICAL PROCEDURES FOR RELATING PHOTOCHEMICAL POLLUTION TO HUMAN PHYSIOLOGIC REACTIONS UNDER CONTROLLED CONDITIONS. Preprint, California Dept. of Public Health, Berkeley, Environmental Hazards Evaluation Unit, 29p., 1968. 16 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session I: Problem Formulation and Analysis, Paper 2.)

A study of the relationship between lung function and air quality was conducted in a specially equipped air filtered room in Los Angeles County General Hospital using 16 subjects who had relatively severe pulmonary emphysema. During the first and third week, each subject breathed the ambient air of the hospital; during the second week this air was filtered through activated charcoal and filter paper. Patients normally entered on Saturday and did not leave the room until conclusion of the three-week period. The filtering period was Saturday through Friday of the second week, so for each week they had two days to adjust to conditions of the room before measurements were begun. Each weekday the patients were given a series of 20 pulmonary function tests at various times during the day including airway resistance, oxygen consumption, forced expiratory volume and other, both resting and after exercise, plus associated measurements of the pulse rate. In addition, four air pollutants were measured four times daily (oxidant, NO, NO2 and particulates. The suggested statistical procedures for investigating the relationship between lung function (LF) and air quality (AQ) for this filtered air study are discussed. Several basic descriptive methods for the purpose of obtaining some insight into the magnitudes of the data and the shapes of the underlying distributions are considered. Some univariate analytical procedures, essentially a series of Wilcoxon two sample tests and some correlation tests are used. Stepwise regression and some multivariate analysis of variance (MANOVA) procedures are employed. Stepwise regression will enable us to determine the order of importance of the effects of the effects of the pollutants on each of the LF tests; these 20 tests are once again considered separately. All test are finally considered jointly in the MANOVA procedures, in which the pollutants can be treated either "jointly" (filtered and not filtered) or individually.##

11337

N.K. Weaver

ATMOSPHERIC CONTAMINANTS AND STANDARDS: ARE SYNERGISTICS EFFECTS SIGNIFICANT? Proc. Am. Petrol. Inst., Sec. V., Vol. 48, pp. 748-760, 1968. 8 refs. (Presented at the 33rd Midyear Meeting of the American Petroleum Institute's Division of Refining, Session on Air and Water Conservation, Philadelphia, Pa., May 16, 1968. Paper 44-68.)

Regulations are being adopted by governmental authorities for the control of air pollutants, and an orderly, reasoned and scientific approach is desirable in the promulation of such standards. The relationships between ambient air criteria, ambient air standards and emission standards are discussed. The major contaminants in the air of urban communities are analyzed with respect to the effects produced by various concentrations of the agent, the level attained in ambient air, and standard which have been adopted. Ongoing experimental work which was designed to elucidate possible synergistic effects in certain airborne systems is described. A Clear understanding of the evolving abatement methodology, and of the adverse reactions--and possible interactions--of atmospheric contaminants is needed in order to develop and implement an effective program for the control of air pollution. (Author's summary)##

11346

E. J. Cassell, M. D. Lebowitz, I. M. Mountain, E. T. Lee, D. J. Thompson, I. W. Wolter, J. B. McCarroll

AIR POLLUTION, WEATHER, AND ILLNESS IN CHILDREN AND ADULTS IN A NEW YORK POPULATION. Preprint, Mount Sinai Medical and Graduate Schools, New York, and Washington Univ., Seattle, ((30))p., 1968. 19 refs. (Presented at the 9th Air Pollution Medical Research Conference, Denver, Colorado, July 22, 1968.)

The results of multivariate analyses of some of the complex and interacting variables in the environment that appear to participate in the production of adverse health effects are presented. These analyses represent steps in the larger process of analyzing multifactorial problems and delineating complex mechanisms. A daily record of the prevalence of a number of common symptoms or illnesses was maintained for a panel of New York City families living within a restricted geographic area for a period of 3 years. 1848 persons participating in the study were followed by weekly interviews for an average of forty-five weeks each, providing 61,000 person weeks of information. Air pollutants were measured in the study area and metecrologic measurements were available from both the study laboratory and from the city. The first step in the analysis included the symptoms "common cold", cough, headache and eye irritation. The four pollutants under consideration were particulate matter, total hydrocarbons, carbon monoxide, sulfur dioxide. The seven

meterologic factors considered initially were wind speed, precipitation, solar radiation in calories per unit area, Temperature, relative humidity, sky cover, and barometric pressure.##

11347

I.R. Tabershaw, F. Ottoboni, W. C. Cooper

OXIDANTS: AIR QUALITY CRITERIA BASED ON HEALTH EFFECTS. (Presented at the Symposium on Air Quality Criteria, June 5, 1968.) J. Occupational Med., 10(9):464-484, Sept. 1968. 51 refs.

Based on a review of the literature and the experience of the State of California in smog control, it is pointed out that oxidant concentrations known to be harmful to man on continuous exposure have been exceeded for many hours during short peak periods on many days in Los Angeles, without producing significant evidence of serious or sustained adverse effects except eye irritation. Nitrogen dioxide has never reached harmful levels in smog although it does sometimes produce decreased atmospheric visibility. The fear is expressed that the mechanisms leading to the production and localization of smog are so complicated that they may never be unraveled, and that attempts at oxidant control, with overemphasis on the first few hours of the photochemical process, may be generating new health problems. Discrimination against reactive hydrocarbons as a method of oxidant control may be ill-advised, and the criteria for air quality should take into consideration the self-cleansing capacity of the air. Emphasis should also be placed on improving combustion technology to make possible the conversion of organic matter to energy without polluting the atmosphere.##

11425T

Nakamura, K.

RESPONSE OF PULMONARY AIRWAY RESISTANCE BY INTERACTION OF AEROSOLS AND GASES IN DIFFERENT PHYSICAL AND CHEMICAL NATURE. Translated from Japanese. Japan. J. Hyg. (Tokyo), 19(5):322-333, 1964. 37 refs.

Inhalation tests were conducted on 25 healthy males to determine their response in pulmonary airway resistance to the interaction of aerosols and irritant gases. The subjects were divided into 3 groups; Group 1 inhaled SO2 for 5 minutes, followed by a mixture of SO2 with a large-size NaCl aerosol; Group 2 inhaled NO2 for 5 minutes, followed by a small-sized NaCl aerosol; and Group 3 inhaled NO2 for 5 minutes followed by a mixture of NO2 and a large-size NaCl aerosol. The airway resistance (AWR) values immediately after inhalation were measured by the airway interruption technique, and the intensities of the reactions were compared. The control values for the AWR were those prior to the tests. The AWR increased synergistically in Groups 1 and 3. In Group 2 the AWR for NO2 and NO2 plus

aerosol was higher than the control value, and practically no change in reaction was observed when the NO2 was mixed with the NaCl aerosol. The synergistic effect of an irritant gas and an inactive aerosol is greatest when the aerosol particle size is around 1 micron, and the increase in airway resistance in this case is believed to be due to reactive constriction of the respiratory bronchiles and alveolar ducts.##

11453T

AIR POLLUTION. ((La pollution de l'air.)) Translated from French. Chambres d' Agriculture, 35(304; Suppl.):1-16, Nov. 1964.

The effects of air pollution in rural and urban areas are reviewed. The effects of pollutants on plants and animals and the effects of radioactivity and pollution due to chemical products are considered for rural areas. In urban areas the consequences of air contamination on man, plants, and materials are considered. Particular emphasis is devoted to air contamination in Paris, which is principally due to emissions from domestic furnaces (3 million combustion units), industrial fumes, and automobiles (1.2 million). These three sources are discussed in detail, with a tabulation of sources of CO2, SO2 and fumes produced, and a discussion on the influence of pollution on materials, urban vegetation and man. A regulation concerning the fight against air pollution and odor in France is presented, including the establishment of "protection zones" and strictures on type, condition and operation of combustion equipment allowed.##

11470T

Henschler, D.

PROTECTIVE EFFECT OF PRETREATMENT WITH SMALL GAS CONCENTRATIONS AGAINST FATAL PULMONARY EDEMA CAUSED BY IRRITANT GASES. ((Schutzwirkung einer Vorbehandlung mit geringen Gaskonzentrationen gegen todliche Reizgas-Lungenodeme.)) Translated from German. Arch. Exp. Pathol. Pharmakol. (Berline), Vol. 238, p. 66-67, 1960. 4 refs.

In order to elucidate the mode of effect of irritant gas, the mechanism of a tolerance increase was studied, as it develops following the effect of small gas concentrations. This effect, which is known for phosgene and ozone, was determined also for nitrous gases. These three gases exert a protective effect of differing intensity with respect to each other, with the exception of the combination of nitrous gases and phosgene. This protection is consequently neither a principle valid for all combinations of irritant gases, nor is it specific for any one type of gas. This finding permits exclusion of an antibody-antigen reaction as the mechanism involved. The following working hypothesis regarding the mechanism of the protective effect is proposed: irritant gases diffuse through the alveolor wall and only that portion which is not hydrolytically disintegrated exerts an edema-inducing effect, by reacting with structural elements of the pulmonary capillaries. The hydrolysis of acid gas is consequently not, as has often been assumed, the basis for the formation of an edema, but an essential factor of detoxication.##

11489

Gol'dberg, M. S.

BIOLOGICAL EFFECTS OF ATMOSPHERIC POLLUTANTS AND HYGIENIC STANDARDS FOR ATMOSPHERIC POLLUTANTS OUTSIDE THE USSR. ((Problema biologicheskogo deistviya atmosfernykh zagryazneii i ikh gigienicheskogo normirovaniya za rubezhom.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):245-250, April-June 1968. ((13)) refs.
CFSTI: TT 68-50449/2

A brief discussion is presented of a few achievements in the biological effects of pollutants and standards in the U.S.A., Great Britain, and Germany. Studies being conducted on the effects on man of prolonged exposure to low concentrations of atmospheric pollutants are mentioned. Air pollution episodes in New York (1953) and London (1952) are briefly mentioned. Also discussed is the problem of the effect of the dispersity of dust particles containing 3.4 benzpyrene upon carcinogenic activity.##

11490

Shandala, M. G.

ON POLAROGRAPHIC STUDIES OF OXYGEN EXCHANGE IN EXPERIMENTAL HYGIENIC INVESTIGATIONS. ((K voprosu o primenenii polyarograficheskogo metoda pri izuchenii kislorodnogo obmena v eksperimental'nykh gigienicheskikh issledovaniyakh.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6): 259-260, April-June 1968.
CFSTI: TT 68-50449/2

Epshtein's method (electrode pairs Au-Zn and Pt-Fe) was used without an oxygen load in conjunction with determinations of the total oxygen consumption at rest and the oxygenation of venous blood, in experimental studies of the effects of different conditions of air ionization on oxygen exchange. Data pertaining to high concentrations of air ions in bipolar ionization are listed in thousands per cc (first chamber, n positive = 183.6 positive or negative 4.9, n negative = 180.0 positive or negative 6.2; second chamber, n positive = 50.2 positive or negative 2.1, n negative = 56.9 positive or negative 3.0; third chamber, used a control, n positive = 0.3 positive or negative 0.01). The experimental male albino rats (three groups of 20 rats each) were placed in the chambers for 8 hr daily for 90 days. Animals in the first chamber for 60 days exhibited statistically comparison with the controls, namely a higher oxygen exchange lev-
comparison with the controls, namely a higher oxygen exchange level el, a higher oxygen consumption at rest, lower venous oxygenation and a lower oxygen tension (higher degree of utilization) in muscle tissue. The differences were still present on the 90th day of exposure; the effect was due to the concentration of air ions in the first chamber. Animals in the second chamber did not differ from those in the third chamber (controls) with respect to

oxygen consumption changes and venous oxygenation during the entire exposure period. Only the determinations of oxygen tension (pO2) in muscle tissue revealed that the lower air ion concentration in the second chamber had an effect. The method of electrochemical recording of oxygen in intact muscle tissue without batteries, even without an oxygen load (Isaakyan), is sufficiently sensitive for long-term experiments.##

11535

Campbell, Kirby I., L. Otis Enik, George L. Clarke, and Roger L. Plata

INHALATION TOXICITY OF THE AIR POLLUTANT PEROXYACETYL NITRATE: DEPRESSION OF VOLUNTARY ACTIVITY IN MICE. Preprint, California Univ., Riverside, Statewide Air Pollution Research Center, and Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ((14))p., ((1968)). 8 refs.

Sublethal acute toxicity, in terms of depression of voluntary physical activity (wheel-running), was determined in mice inhaling the photochemical air pollutant peroxyacetyl nitrate (OAN) for 6-hour per ods at concentration of 2.8, 3.7, 5.5, 6.4, and 8.6 parts per million by volume (ppm). All concentrations tested depressed both 6-hour (test period) and 24-hour activity, following which recovery to standard level required 2 to 4 days. The concentration depressing activity by 50% (termed "Activity50") was estimated at 4.5 and 4.1 ppm for the 6- and 24-hour activity respectively. By use of Activity50 index the toxic potency of PAN was compared with that of other pollutants as follows (descending rank): ozone, acrolein, nitro-olefins, ozonized gasoline vapor, ?pan, nitrogen dioxide, carbon monoxide, irradiated and non-irradiated auto exhaust. The criterion of activity depression at threshold exposures is discussed briefly. (Authors' abstract)##

11539

MacEwen, J. D. and R. P. Geckler

COMPARATIVE STUDIES OF 90-DAY CONTINUOUS EXPOSURE TO O3, NO2 AND CCL4 AT REDUCED AND AMBIENT PRESSURES. (FINAL REPORT.) Aerosjet-General Corp., Azusa, Calif., Contract AF 33(657)-11305, Proj. 6302, Task 630201, AMRL-TR-67-68, 67P., Feb. 1968. 25 refs.
CFSTI, DDC: AD 669079

Ninety-day continuous animal exposures to ozone, nitrogen dioxide and carbon tetrachloride at Threshold Limit Values were conducted under ambient pressure and 100% oxygen-reduced pressure (5 psia) conditions. Four species, dogs, monkeys, rats, and mice were exposed to each material. Guinea pigs were also used for ozone exposures due to their reported susceptibility to this pulmonary irritant. Minimal biologic responses were observed with exposure to each of the compounds tested and, consequently, lower tentative exposure limits are recommended for space cabin environments. The recommended limits, based on the time period tested, are 1 ppm for nitrogen dioxide, 0.01 ppm for ozone, and 0.5 ppm for carbon tetrachloride. (Authors' abstract)##

11565

Freeman, G., S. C. Crane, R. J. Stephens and N. J. Furiosi

PATHOGENESIS OF THE NITROGEN DIOXIDE-INDUCED LESION IN THE RAT LUNG: A REVIEW AND PRESENTATION OF NEW OBSERVATIONS. Am. Rev. Respirat. Diseases, 98(3):429-443, Sept. 1968. 50 refs.

The induction of an emphysema-like condition in rats by continuous exposure to nonedema-producing and non-necrotizing levels of NO2(10 to 25 ppm) is described. The increased weight of the voluminous, air-containing lungs was shown to result from widespread hypertrophy of respiratory epithelium, especially in alveoli closely associated with alveolar ducts and in terminal bronchioles. Neither excessive fluid nor areas appeared compressed. Concentrations of 2+1 ppm during the natural lifespan of the rat (about two to three years) did not cause grossly emphysematous lungs but were associated with either reduction or disappearance of bronchiolar cilia, clear inhibition of normal exfoliation and blebbing of the epothelial cells, and the appearance of cytoplasmic, crystalloid inclusions of uncertain nature.##

11568

Horn, K.

AN UP-TO-DATE REVIEW OF THE EFFECTS OF AIR POLLUTION ON THE POPULATION. ((Uber die Auswirkung der Luftverunreinigung auf die Bevolkerung - Eine neure Obersicht-)) Text in German. Z. Ges. Hyg., 14(6):410-413, June, 1968. 24 refs.

The effects of the increasing incidence of air pollution on human health are discussed. Distinction is made among the immediate (24-48 hr.), delayed (weeks to months), and chronic effects (years) of exposure to air pollution. Four areas considered are: non-specific respiratory diseases; experimental and epidemiological studies on chronic effects of air pollution; studies on premorbid conditions resulting from air pollution; and incidence of lung cancer. Air pollution is viewed as one of many etiological factors influencing incidence of colds, influenza and other respiratory conditions, but it may be a precipitating factor in the development of chronic conditions. Statistical correlations between air pollution (oxides of nitrogen, sulfur, and silicon) and urban incidence of chronic bronchitis, keratoconjunctivitis, atonia and penumonia have been reported. Rheumatic heart disease seems more related to socioeconomic factors than to air pollution. Urban children exposed to air pollution show microcytic anemia and retardation of bone development. Correlation between urban air pollution and lung cancer has been noted. A decrease in lung cancer mortality was reported among British immigrants to USA, Australia or South Africa even though their cigarette consumption remained the same or increased.##

11575

Laurence, K. M., C. O. Carter and P. A. David

MAJOR CENTRAL NERVOUS SYSTEM MALFORMATIONS IN SOUTH WALES. I. INCIDENCE, LOCAL VARIATIONS AND GEOGRAPHIC FACTORS. Brit. J. Prv. Soc. Med., 21:146-160, 1967. 47 refs.

The total births, 1956-62, for 12 areas in South Wales are given in a table. The incidence per 1,000 total births of anencephaly, spina bifida, and hydrocephalus (and the number of cases) is given in a table for the 12 areas studied. The bulk of the population lives in townships which are mostly industrial and in straggling industrial communities and villages. Certain towns with light industry and an average population density of 4.8 persons/acre have incidences of malformations of about 11.7/1000 live births. In a relatively flat agricultural area (three small country towns with a total population of less thn 7000) with a population density of less than 0.6/acre the malformation incidence was 5.6 and 4.3 in the two districts studied. There seemed to be a rural-urban gradient in incidence. In Port Talbot, with a large steelworks, the incidence in wards which do not get the prevailing winds from the steelworks was 5.0/1000 live births while in the remaining wards it was 8.0/1000 live births. The local incidence, population density, type of locality (industrial, agricultural,), area, number of cases, total births, population density, and incidence/1000 births are all given in a table. Local variations are discussed in the light of geological background, water supply, rainfall, sunshine, background radiation, radioactive fallout, population density, and urban/rural areas. None seems to explain the local differences.##

11593

Thomas, A. A.

MAN'S TOLERANCE TO TRACE CONTAMINANTS. Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio, AMRL-TR-67-146, 38p., Jan. 1968. 9 refs.
CFSTI, DDC: AD 669356

Atmospheric contaminants in sealed cabins originate from a multitude of sources: off-gassing from cabin materials, production of contaminants by the life support system components, continuous exposure, a combination of physiological stress from problem increases with progressing mission duration and can becme the limiting factor for man's tolerance to extended space flight. Several important aspects must be considered: truly uninterrupted, , continuous exposure, a combination of physiolcgical stress from the use of artificial atmospheres and the chemical stress imposed by the trace contaminants, and the great potential of synergistic toxic effect by various constituents of the highly complex mixture of many contaminants. Superimposed on these factors are the other aggravating characteristics of prolonged space flight: logistics problems of life support and psychological effects of isolation on performance. Clearly, these factors must

be weighed singly and in combination to allow safe design of future manned systems. Validation of human tolerance to trace contaminants can be accomplished by prolonged animal exposures coupled with mathematical model verification. Tradeoffs in life support system design can extend tolerance to contaminants and long range logistic tradeoffs should be considered by utilizing extra-terrestrial resources for contaminant removal purposes. (Author's abstract)##

11632

Vaughan, Thomas R., Jr., Lesta P. Jennelle and Trent P. Lewis

EFFECTS OF CHRONIC EXPOSURE TO ICW LEVELS OF AIR POLLUTANTS ON PULMONARY FUNCTION IN THE BEAGLE. Preprint, Public Health Service, Cincinnati, Ohio National Air Pollution Control Administration, ((19))p., ((1968)). 29 refs.

One hundred and four beagles have been exposed for 18 months to natural and photochemically reacted auto exhaust, oxides of nitrogen and oxides of sulfur. No differences in single breath carbon monoxide diffusing capacity, dynamic pulmonary compliance or total expiratory pulmonary resistance were found between exposed and control animals. Removal of reactive gases in the upper airway was studied during brief exposures in an additional small group of animals. Under these conditions, 100% removal of O3 and SO2, 90% removal of NO2, 73% removal of NO and no removal of CO or hydrocarbon were found. (Authors' abstract)##

11670

Donald E. Gardner, Robert S. Holzman, and David L. Coffin

EFFECTS OF NITROGEN DIOXIDE ON PULMONARY CELL POPULATION. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ((11))p., ((1968)). 11 refs.

Studies have shown that ozone has produced changes in the number and function of cells obtained by pulmonary lavage. In similar experiments, rabbits exposed to levels of NO2 from ambient to 60 ppm demonstrated increased numbers of polymorphonuclear leukocytes in the lung washings. This phenomenon persisted for more than 72 hours following a single 3-hour exposure. When streptococci were instilled in the lungs of NO2-exposed anesthetized rabbits 30 minutes prior to lavage, a pronounced inhibition of phagocytic activity was observed. Using these criteria, NO2 appeared less effective than ozone as a pulmonary irritant. (Authors' abstract, modified)##

11679

N. D. Weiner, M. Amanat, D. Blondo, R. Caprioli, N. Dinerman, and A. Felmeister

INTERACTION OF NO2 WITH MONOLAYERS OF PHOSPHOLIPIDS EXTRACTED FROM E. COLI AT 15 DEGREE C AND 37 DEGREE C. Preprint, Columbia Univ., New York, Coll. of Pharmacy, 12p., March 29, 1968. 10 refs.

Phospholipids were extracted from E. coli grown at 15 degree C and 37 degree C. The fatty acid residues of the 15 degree C phospholipids were found to be considerably more unsaturated than the 37 degree C phospholipids. These phospholipids were spread as monomolecular films and exposed to NO2 containing atmosphere. Whereas the 37 degree C phospholipid films showed no interaction, NO2 was found to expand considerably the 15 degree C phospholipid films. The results demonstrate that simple changes in environmental conditions may affect markedly the interaction of air pollutants such as NO2 with biological membranes. (Authors' abstract)##

11682

11682
Alvin Pelmeister, Mohammad Amanat and Norman D. Weiner

INTERACTION OF PROTEIN AND LIPOPROTEIN MONOLAYERS WITH NITROGEN DIOXIDE-TRANS 2-BUTENE GASEOUS MIXTURES. Preprint, Columbia Univ., New York, Coll. of Pharmacy, ((8))p., ((1968)). 4 refs.

The interactions of pollutant atmospheres with oriented protein and lipoprotein films was studied. A gas train assembly, Teflon coated trough, and Wilhelmy plated method of surface pressure measurement was used. The films were then exposed to a standard atmosphere (i.e., air flowing at the rate of 300 ml/min) or to the following test atmospheres, all flowing at this same rate of 300 ml/min: (a) 0.33% nitrogen dioxide in air; (b) 0.08% trans 2-butene in air; and (c) 0.33% nitrogen dioxide and 0.08% trans 2-butene in air. Significant changes in the -A curves for the pure protein films were observed in the presence of all atmospheres containing nitrogen dioxide, while the trans 2-butene did not interact with the film, nor did it appear to influence the nitrogen dioxide film interaction. However, whereas exposure of unsaturated phospholipid films to nitrogen dioxide containing atmospheres resulted in a large expansion of the film, exposure of bovine albumin film to these same test atmospheres resulted in a significant contraction of the film. The data obtained suggest that the effect of NO2 on the lipoprotein films studied, appears to be a function only of the phospholipid component of the film. In general, membrane lipoproteins contain a large proportion of unsaturated phospholipids attached to structural and functional protein. In vivo interaction of the supporting phospholipid with nitrogen dioxide, or other reactive pollutants, could result in an expansion of the exposed cell membrane. This expansion would then lead to a change in the conformation of the attached protein. In the case of a functional protein, changes in conformation would be accompanied by changes in enzyme activity.##

11801

Ross, Joseph C.

TRACE CONTAMINANTS. In: Physiology in the Space Environment. Washington, D. C., National Academy of Sciences - National Research Council, 1968, Chapt. 15, p. 113-121. 8 refs.

Studies of sealed environments have identified numerous trace elements in the atmosphere of confined spaces. The contaminants originate in the degradation and off-gassing of materials within a space, from endogenous production within the body, or from some breakdown of equipment or system. As expected, carbon monoxide is one of the trace contaminants in a closed-system. The rate of carbon monoxide production observed in one closed system study was 0.37 ml/man/hr. The threshold limit value in industry for an eight-hour day is 0.01% (100 ppm) for 480 min. Other studies show that ozone is much more acutely toxic than NO2. Nevertheless, exposures to NO2 are common and can cause both injury and death. With exposures of 150 to 200 ppm, bronchiolitis fibrosa obliterans develops; 50 to 100 ppm induces bronchiolotis with focal pneumonaia. Chronic exposure to 10 to 40 ppm can result in chronic pulmonary fibrosis. Animal studies of other trace contaminants suggest that industrial threshold limit values cannot be used as criteria for long-term exposure. This is true for carbon tetrachloride, phenol, indole, skatole, and hydrogen sulfide. However, the knowledge of man's tolerance to trace contaminants over long periods is not complete, nor is enough known about individual hypersensitivities to inhalation of many trace elements.

11806

Gindi, Gene and Caron Roman

TEST OF A BIOLOGICAL MODEL FOR SMOG INDUCED DEATH. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 33-50, 1968. 12 refs.

A mathematical model which links smog-induced deaths to the genetic theory of aging was tested by application to two New York smog episodes and by comparison with the results obtained when the model was applied to the London smog episode of 1952. In the model, death rates were considered to form a fraction of the original population of a particular age group dying in a given interval of time. Therefore, it was necessary to calculate the population of each group at birth. Therefore, a weighted mean age was assigned to a certain age group by weighting each age according to the population of that age in a city at the time of a smog episode. With the population of an age group, and the specific death rate known for a particular year, the cohort population at birth was calculated. Mortality rates were expressed in terms of cohort deaths, and were used to compute the background death rate for each age group. The values obtained for New York were in good agreement, but differed significantly from the London values. It is concluded that they reflect differences in public health levels as well as the effect of contaminants on human biological functioning.

11807

Litt, Robert S., Sarah Vaughan, Patti Birkinshaw, Holly Coit, and Barbara Sanders

EFFECTS OF LOW CONCENTRATIONS OF OZONE ON TEMPORAL DISCRIMINATION. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 51-64, 1968. 12 refs.

The effects of ozone on temporal discrimination and learning time in rats was investigated. Six rats were separated into two groups, as nearly equal as possible, and run on variable and fixed interval schedules, alternately in ozone and ozone-free air. The criteria for switching a rat from one schedule to another was a uniform response rate within runs, consistency between runs, and the character of the response patterns. Almost consistently, learning time decreased in ozone, whether it came between ozone-free runs or after them. The results supported the hypothesis that ozone significantly affects learning time. (Author abstract modified)

11916

A. T. Silakova, and S. A. Rosendz

BLOOD PROTEIN AMIDE NITROGEN AND ITS POSSIBLE DIAGNOSTIC VALUE IN INTOXICATION WITH ELECTRO-WELDING AEROSOL. (Amidnii azot belkov krovi i ego vozmozhnoe diagnosticheskoe znachenie pri vozdeistvii na organizm electrosvarochnogo aerosolya.) Text in Russian. Gigien. Truda i Prof. Zabolevaniya, 12(8):56-58, Aug. 1968. 16 refs.

The aerosol obtained from automatic electro-welding, using An-60 agents, contained in mg/cu m 0.83-1.15 NF, 2-3.18 N2O5, and 120-150 dust--of which 14.4 mg/cu m was Mn, 72-90 mg/cu m Fe, 6-7.5 mg/cu m CaF, and 8.6-10.5 mg/cu m SiO2. Rats placed in exposure chambers were subjected to daily 4 hr aerosol inhalations for 1, 3, 6, or 9 months. The blood from the animals was subjected to acid (1N H2SO4) hydrolysis during which ammonia derived form the blood protein amide groups was measured. The one-month aerosol inhalation reduced the amide group stability: of the total amide N, in the first 10 minutes of hydrolysis, 31% was released as ammonia in controls, as compared to 41-54% in the treated animals. Complete hydrolysis was obtained in the controls in 2 hr and in the treated animals in 30 min. These changes are believed to be caused by Mn. The hydrolysis curves show a characteristic pattern of change in the 1-month period, and stability in the 3, 6, or 9-month period. The curves may be of diagnostic value in cases of intoxication with the electro-welding aerosol.**

12038

HEALTH AND AIR POLLUTION SUBJECT OF NEW STUDIES. Environ. Sci. Technol., 2(4):246-249, Apr. 1968.

For the next seven years, Hazleton Laboratories Inc. will be studying the effects of air pollutants on laboratory animals, including guinea pigs and monkeys. One study financed by Edison Electric Institute and National Coal Association is intended to provide data useful in setting criteria for the three most conspicuous pollutants emitted from stacks of coal-burning plants: SO2, H2SO4 mist, and flyash. Test animals exposed to the pollutants are being checked regularly to determine whether their respiration is being affected and if so, how much. The second study, financed by the American Petroleum Institute will emphasize the possible role of synergism in air pollution. This study will cover various concentrations of five air pollutants: CO, NO2, SO2, lead chlorobromide, and CaSO4.##

12079

Ehrlich, R. and Mary C. Henry

CHRONIC TOXICITY OF NITROGEN DIOXIDE. Arch. Environ. Health, 17(6):860-865, Dec. 1968. 11 refs.

Continuous (24 hr/day) exposure to 0.5 ppm nitrogen dioxide for three months or longer significantly increased the susceptibility of mice to airborne Klebsiella pneumoniae as demonstrated by enhanced mortality. Intermittent exposure to 0.5 ppm NO2 for 6 or 18 hr/day for six months also resulted in a significantly increased mortality. After 12 months exposure to NO2, mice in the three experimental groups showed a reduced capacity to clear viable bacteria from the lung. The reduced rate of clearance was also apparent in the 24 hr/day group after six months' exposure and in the 6 and 18 hr/day groups after nine months' exposure. Serum lactic dehydrogenase isoenzymes showed a shift from the predominately anaerobic band to the aerobic bands after NO2 treatment. (Author's Abstract)##

12157

Smith, Leon E.

CARDIO-RESPIRATORY EFFECTS OF PAN INHALATION DURING EXERCISE. Preprint, California Univ., Riverside, Dept. of Physical Education, 11p., 1964. 11 refs. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, California, Feb. 10-11, 1964.)

Athletes in many cities have often reported pulmonary discomfort during and following competitive activity throughout periods of high concentrations of smog. An experiment was therefore designed in which human subjects, under controlled conditions, were exposed, during rest, exercise and recovery, to a specific constituent of

photochemical smog, namely peroxyacetyl nitrate (PAN). The object of the investigation was to discover if, at concentrations of 0.3 parts per million, (estimated to be the concentration of heavy atmospheric smog) the pollutant, PAN, as contrasted to filtered air, had a significant effect upon specific cardio-respiratory responses of young males. The results of the experiment demonstrated a significant effect of the pollutant PAN upon the oxygen uptake of the subjects occurred when they were exposed to the additional stress of exercise.##

12158

Slote, Lawrence

AN EXPERIMENTAL EVALUATION OF MAN'S REACTION TO AN IONIZED AIR ENVIRONMENT. Preprint, New York Univ., N. Y., 22p., 1961. 17 refs. In: Proceedings of International Conference on Ionization of the Air, Oct. 16-17, 1961.

The motor responses, sensory-motor responses, and sensory responses of 16 males between ages 24 and 56 years were tested in an ionized air environment. The test area was an air conditioned room having a volume of approximately 2000 cubic feet. The temperature in the test area was maintained between 20 degree C and 25 degree C while the relative humidity was maintained between 40 and 60 per cent. The normal ion content of the test area was measured and found to be 150 small negative ions per cc of air and 187 small positive ions per cc of air. The room was lighted with overhead fluorescent fixtures having an overall light intensity of 50 foot-candles. Ambient noise was measured and found to be 60 decibles. Constant levels of both light and noise were maintained during this study. The nasal inhalation of 20,000 small positive ions per cubic centimeter of air for a period of 15 to 25 minutes produced a statistically significant effect of a detrimental nature on: (1) the functional state of the retino-cortical neural system, (2) the motor activity of a relatively small group of muscles, and (3) simple visual reaction time. The nasal inhalation of 20,000 negative ions under the same conditions produced beneficial results on the responses tested. The data presented definitely points to the fact that the inadvertent production of positive ions by such factors as air conditioning, air pollution and hot air space heating could produce immediate effects of a detrimental nature on man's performance.##

12160

Campbell, Kirby I. and Walter L. Crider

ALIEN CONSTITUENTS IN EXPERIMENTAL ATMOSPHERES. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 5p., ((1967?)). 2 refs.

Attention is invited to the possibility that particulate matter is unintentionally generated in atmospheres of whole body inhalation chambers under certain circumstances. An example situation is

cited in which the particle count index indicated formation of alien particulates when dogs were being exposed to nitrogen dioxide gas with or without an intentional particulate component, ferric oxide dust. Some possibilities are mentioned with regard to the nature of the cited phenomenon, influential factors, and biologic implications. (Authors' summary)##

12173

Gustave Freeman, and Glen E. Haydon

EFFECT OF CONTINUOUS LOW-LEVEL EXPOSURE TO NITROGEN DIOXIDE. Preprint, Stanford Research Inst., Menlo Park, Calif., Dept. of Medical Sciences, 10p., 1963. 3 refs. (Presented at the Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

The maximum nitrogen dioxide concentration in air that does not cause death from acute pulmonary edema and allows rats to survive for several months was determined. At this and at lower concentrations, long term effects were studied with particular attention to the pulmonary pathology. Four identical exposure chambers were used. On two occassions, rats exposed to 100 ppm NO2 died within 24 hours. One group of 9 rats was placed in a chamber with a constant level of 50 ppm of NO2. Six animals died between 48 and 68 days. Six rats were exposed to 25 ppm NO2 and all survived the acute phase, but failed to gain weight. Voluminous lungs were seen in all the rats. Pulmonary pathological changes of significance were hypertrophy and hyperplasia of the bronchial and bronchiolar epithelial cells. Proliferation of goblet cells to secrete mucous and proliferation of new connective tissue at the junction of the terminal bronchioles and alveolar ducts were found in rats sacrified after forty days of exposure to 25 ppm of nitrogen dioxide.##

12175

L. S. Jaffe

REVIEW ON CHEMICAL MUTAGENESIS. Preprint, Public Health Service, Washington, D. C., Div. of Air Pollution, ((10))p., Oct. 4, 1963. 19 refs.

Chemical mutagenesis is the process whereby the somatic cells of an organism are induced to produce a change (mutation) by chemical means or by exposure to chemical substances, wherein as a result of this exposure the cell themselves or the daughter cells, formed upon dividings, function less efficiently or differently from the parent cells. In chemical mutagenesis we are concerned with the influence of certain chemicals found in air pollution to form deleterious mutations in the somatic cells of the individual (or animal population) causing it to age more quickly; to change the appearance and nature of the cells anatomically or in function; or to act carcinogenetically and

form cancers in the organism. The prime effects of chemical cancers mutagenesis are of three broad categories: (1) a change in the aging process induced by chemical means; (2) change in the nature and appearance of the cell and/or its function (metaplasia); (3) carcinogenesis.##

12402

Carson, Steven and Richard E. Goldhamer

BIOCHEMICAL DEFENSE MECHANISMS AGAINST PULMONARY IRRITANTS. Food and Drug Research Labs., Inc., New York, Contract AF 33(615)-5309, Proj. 7163, AMRL-TR-67-212, 130p., Oct. 1968. 20 refs.
CFSTI, DDC: AD 680823

Studies were performed in which mammalian mucociliary apparatus was characterized under normal conditions following exposure to three irritant gases: 100 percent oxygen, ozone and nitrogen dioxide. Investigations were made in normal and treated animals providing physical, electrophysiological, biochemical, and morphologic data of effects due to exposure. A method for in vitro microscopic observation of viable cilia and adjacent mucus blanket was described in terms of ciliary beat and movement of particles embedded in the mucus. In vitro volumetric estimation of mucus thickness was compared to electrical resistance measurements in the attempt to provide an in vivo method to determine mucus depth alterations in treated animals. Polarographi studies of oxygen dependent enzyres were carried out on pooled stripped epithelial tissue of untreated animals and comparison made with tissues exposed to ozone and nitrogen dioxide. Exposure to 100 per cent oxygen caused a significant but self-limiting decrease in mucus velocity and viscosity. Acute exposure to nitrogen dioxide (35 and 75 micrograms per kilogram) caused marked dose dependent changes in velocity and viscosity. Exposure to 0.5 ppm ozone for a 14 day period resulted in general mucostasis and elevated viscosity levels. (Author abstract modified)

12646

BEHAVIORAL TOXICOLOGY LOOKS AT AIR POLLUTANTS. Environ. Sci. Technol., 2(10):731-733, Oct. 1968.

Behavioral toxicology research attempts to relate subtle chemical and physiological changes induced in the brain to changes in behavior. A research group under Dr. Charles Xintaras, head of the National Air Pollution Control Administration's behavioral toxicology unit, is studying the effect of various air pollutants on the neurochemistry, neurophysiology, and behavior of rats and monkeys. The Cincinnati group has concentrated its studies on three commonly occurring pollutants: Carbon monoxide which appears to interfere with the subject's awareness of his environment; ozone which may impair vision and depress body temperature; and lead which appears to interfere with brain function. The preliminary studies are discussed and a brief review of the work to be undertaken is presented.##

13058

Menet, Jean-Paul and Edmond Lagarde

EFFECTS OF ATMOSPHERIC OZONE ON THE BACTERIAL POPULATIONS OF A SUBANTARCTIC BIOTOPE. (Effets de l'ozone atmospherique sur les peuplements bacteriens d'un biotope subantarctique). Text in French. Compt. Rend. Acad. Sci. Ser. D. (Paris), 267:2041-2043, Dec. 4, 1968. 7 refs.

Aerobic bacterial populations were determined in samples of pond water taken near Port aux Francais in the Kerguelen Islands at which high ozone levels have been recorded for several years. One series was exposed to the ambient air, the other protected by rubber stoppers. The series exposed to atmospheric ozone (varying from approximately 300-550 milli-atmos cm over a year's period) had lower bacterial counts than the series protected from ozone in 70% of the samples. Destruction attributable to ozone varied from 7-100% with an average of about 40%. The amount of destruction was directly related to increase in the ozone concentration.

13446

Anbar, M. and M. Inbar

THE EFFECT OF CERTAIN METALLIC CATIONS ON THE IODIDE UPTAKE IN THE THYROID GLAND OF MICE. Acta Endocrinol. (Kobenhaven), 46:643-652, Aug. 1964. 21 refs.

It has been reported that certain metal ions interfere with the iodine uptake in the thyroid. The effect of various metallic cations on the iodine uptake into the gland was studied. Ten experimental mice were used for each material to be examined. The metallic cations to be tested were administered in isotope form and traced by a radioactive tracer. The iodine uptake was calculated in terms of % of injected dose accumulated in the gland or as a concentration ratio. Ferric, cupric, mercuric, zinc, cadmium, and nickel ions at the dose level of 0.1 millimoles per kg body weight were found to decrease the uptake of iodine in the thyroid gland. Manganous ions exhibited a similar effect when the dose was doubled. A parallel decrease in fluoroborate could be demonstrated. This suggests an interference at the stage of iodide accumulation. Cobaltous, cobaltic, magnesium, beryllium, and zirconium ions were shown to have not effect on iodine uptake at the same dose level. The extent of influence upon thyroxine production was discussed.

13525

Kilburn, Kaye H.

CLEARANCE FROM ALVEOLI TO THE CILIARY ESCALATOR: IMPLICATIONS FOR PULMONARY DISEASES. In: Tenth Aspen Emphysema Conference: Current Research in Chronic Obstructive Lung Disease, p. 3-25, June 1967.

Experimental data indicate that clearance of inhaled material from the lung depends upon endocytosis, alveolar clearance by surface forces, and mucociliary clearance along the tracheobronchial epithelium. Experimentation with frog lung suggested that alveolar clearance occurred due to movement of dilute and thin (sol) mucus from its point of secretion in type B alveolar cells and Clara cells to various levels up the airway where it is reabsorbed. Microvilli of the ciliated cells may be important in maintaining optimal thickness of the sol layer of the viscoelastic mucus transport system. Observation of the evaginated frog lung supported this model. Damage to such a transport system with reabsorptive failure may help to explain the occurrence of large quantities of secretions in patients with airway disease.

13846

Sapse, A. T., B. Bonavida, W. Stone, Jr., and E. F. Sercarz

HUMAN TEAR LYSOZYME III. PRELIMINARY STUDY ON LYSOZYME LEVELS IN SUBJECTS WITH SMOG EYE IRRITATION. Am. J. Ophthal., vol. 66:76-80, July 1968. 11 refs.

Human tear lysozyme (HTL) levels were measured in 21 subjects complaining of eye irritation while in smog-polluted areas of Los Angeles, primarily the San Fernando Valley and Azusa. Later, tear specimens collected from 12 patients were compared to those taken from the same patients after an interval of several hours in a pollution-free, air-conditioned room. HTL content in subjects with eye irritation was found to by 60% below normal. Under smog-free conditions, HTL levels were about 60% higher than normal. The reason for the decrease is unknown but may be attributed to several possibilities: (1) the total protein may have decreased due to the increased flow in tears, (2) HTL may be removed from the eye fluids either from destruction or binding to the tissues, or (3) smog or fumes may have inhibitors which inactivate HTL.

13852

Buckley, Ramon D. and Clayton G. Loosli

EFFECTS OF NITROGEN DIOXIDE INHALATION ON GERMFREE MOUSE LUNG. Arch. Environ. Health, 18(4):588-595, April 1969. 16 refs.

The role of nitrogen dioxide (NO_2) alone as a causative agent of structural and metabolic alteration to lung tissue, without the synergistic effects of superimposed bacterial or viral infections, was investigated by exposing germfree mice to pure NO_2 in sterile chambers and then killing them after an appropriate exposure period. This method made possible the production and characterization of a chemically induced lesion not altered by the presence of respiratory disease-causing organisms. Examination of the NO_2-exposed tissue showed that alterations involved primarily the bronchiolar epithelium and alveolar tissue near terminal bronchioles and suggested that

a stimulation in cell activity, rather than damage and destruction, results from NO2 inhalation, at least at the exposure levels involved. Results also suggested that only cells in direct contact with NO2 undergo structural and metabolic change. In an additicnal study, both germfree and conventional mice, after NO2 exposure, were contaminated with either staphylococcus aureus bacteria or with influenza virus. Although there was greater deposition of organisms in the lung of NO2-exposed animals than in the germfree control group, the lung clearance rates fcr S. aureus of both groups were nearly identical. Control and NO2-exposed germfree mice both responded to virus contamination with significantly increased resistance, much the same as conventional mice, a phenomenon which is not understcod at present.

13860

Feldstein, M.

TOXICITY AND ANALYSIS OF AIR POLLUTANTS. J. Forensic Sci., 14(3):337-351, July 1969. 44 refs.

The emission of solids, liquids, and gases from industrial operations, power and heat generation using fossil fuels, combustion of organic waste materials, and auto exhaust constitute the major sources of air pollution. Carbon monoxide, as a community air pollutant, is emitted to the atmosphere from most combustion operations where incomplete combustion of organic matter occurs. Exposures to 30 ppm for four to six hours may result in blood carboxyhemoglobin concentrations as high as 8% of the total pigment. Nitrogen dioxide is the primary reactant in photochemical smog, and is found to cause acute pulmonary edema. Physiological response to low concentrations of both SC2 and SO3 is similar and involves bronchial constriction. The response with SO3 is 4 to 20 times greater in experimental animals than with SO2 on an equal concentration basis. It is now believed that there is no tolerable dose of a carcinogen. Skin tumors were produced in animals by as little as 0.4 micrograms of benzpyrene. Part of the reascn for increased lung cancer is ascribed to carcinogens present in air pollution. Several other pollutants and the various ways of analyzing pollutants are also discussed.

13868

Yokoyama, Eiji

VARIATIONS OF VENTILATORY DYNAMICS IN EXPERIMENTAL EXPOSURE TO SO2 AND NO2. (SO2 oyobi NO2 jikken-bakuro-ji no kanki-rikigaku-chi no henka). Text in Japanese. Arerugi Nippon Zasshi (Jap. J. Allergy), 16(10):56-60, Oct. 1967. 17 refs.

Six healthy adults aged 20 to 36 were experimentally exposed to SO2 gas, and five healthy adults aged 18 to 37 were exposed to NO2 gas. Pulmonary flow resistance, pulmonary compliance,

FRC, and respiratory rate were measured. Concentrations of SO2 during the experiment were 36 to 40 ppm; those of NO2 were 6 to 17 ppm. Experimental exposure to these two gases and similar analyses were made in anesthetized dogs and guinea pigs. Flow resistances of the lungs and thorax because of bronchoconstriction were commonly increased by both SO2 and NO2 in three experiments. The following response to these gases, however, differed. Increase of pulmonary flow resistance to SO2 was inhibited by the subcutaneous administration of 0.7 mg of atropine sulfate, but no inhibition by atropine was observed with NO2. Respiratory rate was increased by NO2 and decreased by SO2 in an experiment with guinea pigs. Variation in pulmonary compliance was more marked with NO2 than with SO2. The SO2 was found to stimulate mainly the upper respiratory tract (nose, throat, and upper trachea) because it is water-soluble and because more than 95% of it is absorbed within the upper respiratory tract. The NO2 was found to stimulate mainly the peripheral portion of the lung because it does not dissolve easily in water and thus is easily brought to the peripheral portion of the respiratory tracts. Nitrogen dioxide was found to have an oxidizing action and to damage the pulmonary mucosae more markedly than the reductive action of SO2.

14050

Gregory, Arthur R. and Charles H. Hine

NEONATAL RESISTANCE TO LUNG EDEMA. Proc. Soc. Exp. Biol. Med., vol. 128:693-695, July 1968. 15 refs.

The resistance of newborn rats and mice to lung edema was determined by simultaneously injecting adult rodents and their newborn offspring with thiourea and by comparing the toxicity of inhaled NO2 in adults and newborn. Newborn rodents survived injections in good health but the mothers, in grooming their young, ingested fatal amounts of thiourea. Their deaths were characterized by pulmonary edema and hemorrhage. The median lethal dose (LD50) of thiourea for adult rats was 47 mg/kg; that for newborn rats was 1.2 gm/kg. Resistance to NO2 was also high in the young. These results are in direct contrast to both original data and data from the literature on the ordinarily increased sensitivity of newborn animals to most drugs and toxic agents. It is theorized that immaturity of the pituitary-adrenal axis, together with thyroid deficiency and thyroid insensitivity, is important in the resistance of newborn animals to these inducers of lung edema. Hypoventilation is also suggested as a possible protective mechanism.

14065

Weiner, N. D., M. Amanat, D. Blondo, R. Caprioli, N. Dinerman, and A. Felmeister

INTERACTION OF NO2 WITH MONOLAYERS OF PHOSPHOLIPIDS EXTRACTED FROM E. COLI AT 15 AND 37 DEGREES. J. Pharm. Sci., 57(8):1398-1400, Aug. 1968. 10 refs.

The purpose of the study was to determine whether the membrane phospholipids extracted from Escherichia coli grown at 15 and 37 deg would exhibit differences in their interaction with an air pollutant such as NO2. The fatty acid residues of the 15 deg phospholipids were found to be considerably more unsaturated than the 37 deg phospholipids. These phospholipids were spread as monomolecular films and exposed to NO2-containing atmospheres. Whereas the 37 deg phospholipid films showed no interaction, NO2 was found to expand considerably the 15 deg phospholipid films, probably the result of the interaction of NO2 with the double bonds of the unsaturated fatty acid groups. The results demonstrate that simple changes in environmental conditions may markedly affect the interaction of air pollutants such as NO2 with biological membranes. (Author abstract modified)

14079

Abe, Mutsuo

EFFECTS OF MIXED NO2-SO2 GAS ON HUMAN PULMONARY FUNCTIONS. Bull. Tokyo Med. Dental Univ., 14(4):415-433, 1967. 30 refs.

Experimental studies were carried out on the effects of SO2, NO2, and a mixed SO2-NO2 gas on the human pulmonary functions by measuring the values of ventilatory mechanics, by spirometry, and by peak flow rate. The effects of SO2 are immediate but not durable. Those of NO2, on the contrary, are late-acting and durable. The effects of a mixed SO2-NO2 gas are intermediate between those of NO2 and SO2 alone, showing no cumulative effects of the two gases, only additive ones. Such differences of the effects between two gases are supposed to be attributed to the grade of water solubility of each gas; SO2 is readily soluble and NO2 difficultly soluble. (Author abstract modified)

14119

Heuss, Jon M. and William A. Glasson

HYDROCARBON REACTIVITY AND EYE IRRITATION. Environ. Sci. Technol., 2(12):1109-1116, Dec. 1968. 21 refs.

Twenty-five hydrocarbons and nitric oxide were irradiated in a smog chamber. Eye irritation and various chemical reaction rates and product yields were used to measure hydrocarbon reactivity. Although the chemical measurements of reactivity correlated with one another to a fair degree, there was no correlation between any of the chemical measurements and eye irritation. A correlation was found between hydrocarbon structure and eye irritation; a hydrocarbon reactivity scale based on eye irritation is presented. The most potent precursors of eye irritation were benzylic hydrocarbons and aromatic olefins. A new and extremely potent eye irritant, peroxybenzoyl nitrate, a lachrymator 200 times as potent as formaldehyde, was identified as a product from the irradiation of benzylic hydrocarbons and aromatic olefins. (Author abstract modified)

14377

Freeman, Gustave, Sheldon C. Crane, Robert J. Stephens, and N. J. Furiosi

ENVIRONMENTAL FACTORS IN EMPHYSEMA AND A MODEL SYSTEM WITH NO2. Yale J. Biol. Med., 40(5-6):566-575, April-June 1968. 44 refs.

A model of an emphysema-like disease based on the covert effects of environmental NO2 is described. The model suggests how some of the features that define emphysema in man may occur. Twenty-one month-old rats were exposed to concentrations of 0.8 ppm of NO2, a level already achieved in smog. They and an equivalent control group lived out their natural lives of 2-3 years and died of similar commonplace diseases of old age apparently unrelated to NO2 exposure. The only difference between the groups was a sustained tachypnoea of about 20% above normal in rats exposed to NO2. Microscopically, lungs were essentially without blemish except for occasional evidence of bronchial epithelial changes. A similar experiment with 2 ppm of NO2 produced the same results. The bronchial epithelial cells exposed to NO2 were more uniform in size and the lumenal surfaces were smoother than in the controls. Functionally, it was suggested that inhaled particles, infectious or not, might be retained due to deficient ciliary cleansing of alveoli and bronchicles. The next higher concentration, 4 ppm, was terminated after 16 weeks. Grossly, the lungs were not clearly different from the controls, but the terminal bronchiolar epithelium was hypertrophic, characterized by increased height and uniformity of the cells. In all cases, continuous breathing of 10 ppm NO2 gave rise to large, air-containing lungs that did not collapse under atmospheric pressure. Animals exposed to 10 ppm began to die of respiratory failure after 16 months. They grew less well and developed thoraces with increased anterior-posterior diameters. Lungs of rats dying of exposure to 12 or 25 ppm NO2 looked alike, except that the longer survival of 16-30 months of the former allowed changes in them to become more advanced than in rats that died after 5-6 months from 25 ppm. It was concluded that by selective timing and dosage of NO2, lesions of the lung may be achieved that resemble more closely the generalized destructive, bullous-forming stage of the disease recognized by many pathologists as the determining symptom of terminal emphysema in man.

14493

Chen, C., K. Okamoto, and T. Nakajima

THE HISTOPATHOLOGICAL STUDY ON THE LUNG OF MICE EXPOSED TO 0.7-0.8 PPM NO2 GAS FOR A MONTH. (NO2 gas (0.7-0.8 ppm) ni renzoku ikkagetsukan bakuro shita mausu hai no byori soshiki gaku teki kenkyu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 24(1):91, April 1969.

To study the effect of exposure to nitrogen dioxide gas on lungs and trachea, mice four weeks of age were placed in a exposure chamber and continuously exposed for 30 days to 0.7 to 0.8 ppm

concentrations of nitrogen dioxide gas, supplied by heating liquid NO2. Air for dilution was passed through a dehumidifier, filter, and activated carbon. Air velocity in the chamber was 5 cm/sec, temperature 24 to 26 deg, relative humidity 40 to 70%, and the light transmission rate of dust was less than 1%. The mice were given ample food and water. A control group of mice was raised under similar conditions but in the absence of NO2. No statistically significant difference in growth rate was observed between groups. On the 15th day of exposure to the gas, accelerated secretion of mucus, degeneration, and desquamation were observed at the mucus epithelium of the trachea. Lung congestion and increased secretion of mucus in bronchial tubes was also noted. By the 30th day, advanced negative and degeneration of the mucus epithelium was evident in both lungs and trachea. The results show that catarrhal changes in lung and trachea occur following exposure to less than 1% (sic; 1 ppm/) NO2 gas.

14553

Ichinosawa, A., H. Takahashi, Y. Tsunetoshi, and T. Shimizu

ETIOLOGICAL CONSIDERATIONS WITH RESPECT TO CHRONIC BRONCHITIS IN JAPAN. (Honpo ni okeru mansei kikanshien no byoin-teki kosatsu). Text in Japanese. Nippon Rinsho (Japan Clin.), 25(9):2054-2063, Sept. 1967. 34 refs.

The etiological influence of air pollution on the incidence of chronic bronchitis is discussed. Six areas in Osaka and its vicinity were classified into three severely, one moderately, and two mildly polluted areas. Concentrations of SO2, NO2, and ozone and amount of settling dust were measured. Incidence of chronic bronchitis in the severly polluted areas was higher (twice as great in males and three times as great in females) than that in the mildly polluted areas. Males were more frequently and severly involved than females. Smoking and SO2 concentration were the most important causes of this disease in any district, and the correlation between the concentration of SO2 and occurrence of chronic bronchitis was demonstrated mathematically. In younger age groups, certain constitutional factors influence the occurrence of the disease, while in older age groups, environmental factors are more influential. It was difficult to determine the minimal predisposing conditions necessary to provoke chronic bronchitis, since there were so many variations in physical conditions among the subjects.

14732

Mueller, Harald

POWER ECONOMY AND AIR POLLUTION. (Energiewirtschaft und Luftverunreinigung). Text in German. Electro-Techniek (The Hague), 46(20):421-430, Oct. 3, 1968. 89 refs.

Types of pollutants, the effects of air pollution on humans, animals, plants, and materials, as well as control measures

taken by power plants are revieved. About 20 to 35% of the solid pollutants in the atmosphere comes from domestic heaters, 35% from industries, and 25% from automobile exhaust gases. Of the gaseous pollutants, the most dangerous is SO2. Regulations in Russia limit their concentration in the atmosphere to 0.06 ppm. In Gelsenkirchen in the Ruhr valley, Germany, a concentration of 0.12 ppm has been measured. The threshold limit value (TLV) referred to eight-hour daily exposure has been set at 5 ppm for NO2. Electrostatic precipitators, mechanical separators, centrifugal separators, scrubbers, and bag filters are all used by power plants. Desulfurization of flue gases and of the fuel is also mentioned as a possible solution. High stacks positively influence the dispersion process. The power output by the plants erected in 1950 rose 375% by 1963. Dust emission, however, has been reduced to 70% of the 1950 value.

15206

Pagnotto, L. D. and S. S. Epstein

PROTECTION BY ANTIOXIDANTS AGAINST OZONE TOXICITY IN MICE. Experientia, 25(7):703, 1969. 11 refs.

The role of free radical injury in ozone toxicity and the practicality of chemical protection against the toxic effects of ozone and atmospheric oxidant pollutants were investigated. A total of 16 antioxidants was administered to 6-8 week old mice weighing 20-22 g. Four daily injections of 0.1 ml solutions or suspensions in saline or tricaprylin were given. Dosage of antioxidants was based on maximum sub-lethal levels which were determined by preliminary toxicity tests. Equal numbers of test and control mice were exposed to ozone for 4 hrs in two stainless steel chambers 1 hr after the last injection of antioxidant. Ozone concentrations were maintained at 9-11 ppm, producing mortalities of 80-90% in the untreated controls. Experiments were replicated using groups of 10-20 mice in each experiment. Protection by antioxidants against ozone toxicity was measured by the reduction in mortality of the test in relation to the control mice. Significant protection was produced by six antioxidants, particularly AHQ, primaquin, and EMQ. It was concluded that the practical implications of such protection should be explored.

15211

Terry, R. A., D. G. Harden, and A. M. Mayyasi

EFFECTS OF NEGATIVE AIR IONS, NOISE, SEX AND AGE ON MAZE LEARNING IN RATS. Intern. J. Biometeorol., 13(1):39-49, 1969. 4 refs.

The effect of negative air ionization, noise, age, and sex on maze learning in rats was investigated; 240 rats were tested. Equal numbers of males and females were divided into two age groups: the young group was 21-30 days old and the adult group was 90-100 days old. The age of the rats was held constant during the five

weeks of the experiment by weekly supply from the breeding colony. They were exposed to two levels of noise; 30 and 90 decibels, and three levels of negative air ions: zero concentration, 7,000,000, and 70,000,000 ions/cc. Time and error scores of the rats running in a modified Lashley left-right maze with an escape-from-water motive served as criteria. A randomized complete blocks design (2 times 3 times 2 times 2 times 10) with replications was selected for treatment by analysis of variance. The results indicated that males show significantly lower error score in negatively ionized air and females swim significantly faster than males under all investigated conditions with no apparent effect of noise or ions on their performance.

15215

Freeman, G., S. C. Crane, and N. J. Furiosi

HEALING IN RAT LUNG AFTER SUBACUTE EXPOSURE TO NITROGEN DIOXIDE. Am. Rev. Respirat. Disease, 100(5):662-676, 1969. 13 refs.

The nature of healing was observed in rats after 1, 4, 10, 16, and 20 weeks of continuous exposure to 15 + or - 2 ppm nitrogen dioxide. Animals from each group were allowed to recover for 0, 8, 20, and 52 weeks and were compared with control rats of the same age. Lung weights increased at two different times as compared with those of the control animals. The first was associated with hypertrophy of bronchiolar and adjacent alveolar epithelium. This tended to return toward normal during recovery. The second occurred in aging, recovering rats, long after contact with NO2 had ceased. This was consistent with an increase in the staining property of collagen and elastic tissue in the alveolar parenchyma, which was most noticeable in the ductal areas. Between the two increments, lung weights were equivalent to those of control animals. Healing in the longer-exposed rats left some inhomogeneity of the air spaces of the parenchyma and some partial or possibly complete closure by fibrosis of the terminations of the bronchioles. Septal walls were sometimes attenuated and fractured. Both atresia of terminal bronchioles and discontinuities in altered elastic tissue may account in part for the apparently reduced elastic recoil of lungs of exposed animals. (Author summary modified)

15383

Krueger, A. P., P. C. Andriese, and S. Kotaka

SMALL AIR IONS: THEIR EFFECT ON BLOOD LEVELS OF SEROTONIN IN TERMS OF MODERN PHYSICAL THEORY. Intern. J. Biometeorol. (Leiden), 12(3):225-239, 1968. 25 refs.

The relationship between air ion density and the blood levels of 5-hydroxytryptamine (5-HT) in mice was studied. Eight-week old male mice were kept in cylindrical plexiglass holding chambers and exposed to ionized atmospheres for varying amounts

of time. Under stringently controlled environmental conditions in which only the small air ion content of the ambient air was varied, positive ions raised blood levels of 5-HT in the mouse and negative ions depressed them. Examination of the experimental evidence in terms of the modern physical theory of air ion formation and composition led to the hypothesis that the ions H(+)(H2O) and (H3O)(+)(H2O)n were the physiologically active constituents of positively ionized air, while O2(-)(H2O)n and OH(-)(H2O)n were the active agents in negatively ionized air. Further tests were conducted with positive molecular ions of CO2, O2 and N2 and with negative molecular ions of CO2 and O2 emitted separately into pure air containing water vapor. The effects on the blood level of 5-HT in mice support the initial hypothesis and are in accord with physical theory.

15490

Holland, George J., David Benson, Albert Bush, George Q. Rich, and Robert P. Holland

AIR POLLUTION SIMULATION AND HUMAN PERFORMANCE. Am. J. Public Health, 58(9):1684-1691, Sept. 1968. 35 refs.

The effect of short-term exposure to moderate levels of photochemical air pollutant constituencies on the efficiency of various types of human motor performance was determined. Reaction time, vital capacity, and submaximum work performance on the bicycle ergometer were measured in 14 college student volunteer subjects. The subjects were randomly assigned to one of two groups according to the Latin square method of experimental design. They served alternately on two occasions as either control subjects in a normal atmospheric environment or as experimental subjects in an air pollution environment. In order to simulate the conditions of the Los Angeles Basin, a test facility was designed. Irradiated exhaust gases from an automobile were pumped into an exercise booth near the reaction tunnel. A ventilation system was used to replace the exhaust gases with filtered atmospheric air during the control experiments. Air samples were analyzed for carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, oxidants, hydrocarbons, aldehydes, and formaldehyde. It did not appear from the study that the performance of fine neuromuscular tasks such as reaction time or cardiorespiratory work efficiency were significantly altered by short-term exposure to moderate levels of air pollution. More study is required to elucidate the effects of air contaminants on other types of human psychomotor performance, especially maximum work capacity. Many atmospheric pollutants may have an insidious qualitative biochemical effect on human physiological processes which can only be identified through careful longitudinal study. Future studies involving higher levels of contamination with more precise measures of airway resistance are recommended.

15579

Coffin, David L. and Earl J. Blommer

ALTERATION OF THE PATHOGENIC ROLE OF STREPTOCOCCI GROUP C IN MICE CONFERRED BY PREVIOUS EXPOSURE TO OZONE. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 10p., 1969. 13 refs. (Presented at the International Symposium Aerobiology, Third, Sussex University, Brighton, England, Sept. 15-19, 1969.)

To obtain data on the influence of ozone on clearance rate, bacterial growth, and mortality, pathogen-free mice approximately 20 days old, were divided into two groups, one of which was exposed to ozone for three hours. After the ozone exposure, both groups were exposed to an aerosol consisting of diluted Group C streptococci following which the clearance rate, bacterial growth, and mortality studies were conducted. A marked decline in the number of cultivable organisms followed the introduction of pathogenic streptococci in mice not exposed to ozone. Three-hour exposure to 1-5 ppm ozone increased the number of organisms cultivable at four hours. At levels of 0.11 ppm or below, bacterial counts for the ozone treatments could not be distinguished from the controls. Beyond four hours after aerosol exposure, marked variability in the number of cultivable cells was noted mice except those exposed to the highest ozone concentrations with them mortalities approached 100%. It is concluded that exposure of mice to ozone increases the possibility of death from subsequent infection by aerosolized streptococci. Associated with the increased mortality is prolonged retention of intrapulmonary bacterial viability, a shortening of the lag phase, and an increased rate of bacterial multiplication. The diminished lag phase and enhanced bacterial growth contribute to the slowing of the so-called bacterial clearance rate. Bacterial invasion of the blood appears to take place from two to four days inclusively and equates with subsequent mortality. Bacteria present in the blood are in insufficient numbers to appreciably affect the total lung counts.

15680

Yokoyama, Eiji

A COMPARISON OF THE EFFECTS OF SO2, NO2, AND O3 ON THE PULMONARY VENTILATION OF GUINEA PIGS. (SO2 to NO2 oyobi O3 no kankino moyobosu eikyo no hikaku-monumotto no okeru bakurojikken). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 11(11):563-568, Nov. 20, 1969. 21 refs.

Ventilatory functions of guinea pigs were quantitatively measured before, during, and after 2-hour exposure to SO2, NO2, and O3. The gases caused an increase in the flow resistance of the animals, although the degree of change varied for the three gases. A significant difference was observed in the direction of change in the respiratory rate. Sulfur dioxide caused a decrease in the respiratory rate while NO2 and O3 caused a decrease. The

tidal v[illegible]e changed in a direction opposite to the change in the respiratory rate. The changes in the ventilation function of the respiratory system were attributed to differences in lung area between exposures. (Author abstract modified)

15725

Krueger, A. P. and S. Kotaka

THE EFFECTS OF AIR IONS ON BRAIN LEVELS OF SEROTONIN IN MICE. Intern. J. Biometeorol., 13(1):25-38, 1969. 42 refs.

Experiments performed to determine the influence of high, moderate and low densities of positive or negative air ions on serotonin (5-hydroxytryptamine, a neurohormone) in mice are described. Mice were placed in a controlled pollutant-free microenvironment and exposed for 12, 24, 48, and 72 hours to 3 different concentrations of small positive or negative air ions. The concentrations were 2000-4000 ions/cu cm, 30,000-40,000 ions/cu cm, and 350,000-500,000 ions/cu cm. Spectrofluorometric assays of brain serotonin levels of air ion-treated mice showed statistically significant differences as early as 12 hrs from those of mice kept in untreated pollutant-free air. Essentially no deviation from control values were observed at 24 and 48 hours. After 72 hours of exposure sharp decreases took place in all groups with the single exception of the animals exposed to 30,000-40,000 positive ions/cu cm. The hypothesis that alterations in mood and affect associated with certain meteorological conditions might depend upon air ion-induced changes in brain levels of serotonin was examined in the light of recent advances in neurophysiology and neuropharmacology. Since the air ion content of the atmosphere is the only known variable associated with shifts in serotonin in the brain, the hypothesis was accepted. This does not signify the attainment of insight into a reasonable physiological mechanism which would account for the uniformity of serotonin reduction brought about by ions of either charge and by varying dosages of these ions, nor was these a satisfactory correlation established between reported air ion effects on mood, affect on behavior, and air-ion induced alterations of serotonin in the brain.

15732

Won, William D. and Harold Ross

REACTION OF AIRBORNE RHIZOBIUM MELILOTI TO SOME ENVIRONMENTAL FACTORS. Appl. Microbiol., 18(4):555-557, Oct. 1969. 9 refs.

The laboratory findings on the behavior of airborne R. meliloti (102F5) in relation to relative humidity (RH), ultraviolet light radiation, and certain common gaseous atmospheric pollutants were reported. Survival of R. meliloti in aerosols at 20 C was maximal at high RH and minimal at low RH. Relatively high concentrations of nitrogen dioxide, sulfur dioxide, or formaldehyde were needed to significantly reduce viability of R.

meliloti in aerosols at 50% RH. Except for the reduction in activity of formaldehyde by SO2, there was no additive or antagonistic effect of mixing pollutants. High environmental RH enhanced bactericidal activity of NO2 and SO2. High RH minimized and low RH accentuated the biological effect of ultraviolet light of 300 to 400 nm wavelength. (Author abstract modified)

15747

Belanger, William F.

A STUDY OF THE EFFECTS OF AIR POLLUTION ON HOSPITAL ADMISSIONS. Preprint, Philadelphia Dept. of Public Health, Pa., Air Management Services Div., 8p., Sept. 1969. (Presented at Air Pollution Committee Meeting, Philadelphia County Medical Society, Philadelphia, Oct. 27, 1969.)

A preliminary study on the effects of air pollution on health was conducted. Total oxidants, soiling index, sulfur dioxide, and nitrogen oxides were measured near the hospital. Hospital data were drawn directly from the patient-card files. Hospital admissions, after elimination of admissions not directly concerned with pollution effects, were broken into total respiratory admissions, respiratory infections only, respiratory infections including undiagnosed cases, respiratory growths, total respiratory for children under 10, total respiratory for adults over 60, eye irritation, cardiac patients, and vascular patients. Sixty-three visual comparisons yielded one very strong correspondence between soiling index and total respiratory admissions. An additional relationship between sulfur dioxide and total respiratory admissions was weak. The breakdown of respiratory admissions into subcategories yielded numbers of admissions too low to make a comparison, and so the prediction of the sensitive areas of the population was not possible. Coefficients of correlation were calculated for individual months for total respiratory admissions against air pollution variables. Data showed significant correlations for soiling index, sulfur dioxide, and nitrogen oxides. The correspondence between soiling index and respiratory admissions was especially marked. This effect occurred as low as 0.75 COH. It was apparent that the correspondence of soiling index peaks and peaks in respiratory admissions should be further investigated. It was recommended that the soiling index be related to air quality standards with a maximum of about 0.75 COH.

15794

Gottlieb, Sheldon F., Allen Cymerman, and Albert V. Metz, Jr.

EFFECT OF XENON, KRYPTON AND NITROUS OXIDE ON SODIUM ACTIVE TRANSPORT THROUGH FROG SKIN WITH ADDITIONAL OBSERVATIONS IN SCIATIC NERVE CONDUCTION. Aerospace Med., 39(5):449-453, May 1968. 19 refs.

In an attempt to understand the cellular basis of the biclogical effects induced by the helium grcup of elements, the effect of xenon and krypton on the sodium active transport (NaT) across frog skin was determined. Experiments using the short-circuit current technique indicated that approximately 200 psig Xe, 950-1000 psig Kr, and 200 psig N2O reversibly inhibited sodium active transport. The inhibitien was not due to pressure per se. The pressures of the gases which reversibly inhibit NaT in the frog skin also induce reversible conduction blockade in frog sciatic nerve. A linear relationship was found to exist between the log of the pressure required to produce nerve conduction blockade and the molecular polarizability of the gases. The involvement of sodium ions in membrane depolarization and in controlling important physiological phenomena suggests that inhibition of sodium ion transport by N2O, Xe, and Kr may be only one of several gas induced effects. Thy gases probably produce other functional and structural cellular changes.

15812

Thomas, Heriberto V., Peter K. Mueller, and Robert Wright

RESPONSE OF RAT LUNG MAST CELLS TO NITROGEN DIOXIDE INHALATION.
J. Air Pollution Control Assoc., 17(1):33-35, Jan. 1967. 16 refs.

The hypothesis that irritant gases in concentrations occurring in polluted atmospheres might play a role in the degranulation and histamine release processes of mast cells in lung tissue was tested. Young rats weighing 140-150 g were exposed to 1 ppm nitrogen dioxide for 2 hr. One group was killed immediately, another group 24-27 hr after exposure. A third group was exposed to 0.5 ppm nitrogen dioxide for 4 hr and killed immediately. Animals serving as controls were placed for 1 hr into the exposure chamber ventilated with ambient air. Standard histological preparations were made after Carnoy's fixative and subsequent staining with toluidine blue. The mast cells of the control animals appeared relatively intact with no evidence of disorientation. The cells of the animals exposed to NO2 and sacrificed immediately revealed rupture and loss of cytoplasmic granules with some disorientation. These changes were observed in the pleura, bronchi, and surrounding tissue with the effects more marked in the mediastinum. In some cases, the mast cells of exposed animals sacrificed about 24-27 hr after discontinuing the exposure showed a combination of ruptured and intact cells with a predominance of the latter: in other cases, the cells could not be differentiated from those of the controls. The findings indicated that 24 hr or more are required to reverse the acute effects of NO2 inhalation. The toxicological implications are discussed: Loss of cell integrity caused by nitrogen dioxide is followed by the release of the proteolytic enzyme chymotrypsin, the hydrolytic enzyme phospholipase A, and other substances. In acute reactions, the released granules are ingested by fiberblasts with the formation of new cells. In chronic situations, the formation of new cells gives way to fibrillo enesis and, ultimately, fibrotic tissue.
(Author abstract modified)

16055

Vaughan, Thomas R., Jr., William J. Moorman, and Trent R. Lewis

CARDIOPULMONARY RESPONSES TO ACUTE OZONE EXPOSURE. THE ROLE OF HISTAMINE. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 24p., 1969.. 30 refs.

Cardiopulmonary responses in acute exposure to ozone, and the role of histamine in tolerance production, was studied. Anesthetized, tracheostomized dogs were exposed to high concentrations of ozone. Mechanisms of physiological responses to ozone were studied by prior vagotomy, prior treatment with a histamine-depleting agent, and concomitant exposure to an aerosol of isoproteronol. Inhalation of 50 ppm ozone produced transient apnea, followed by tachypnea, decreased dynamic compliance (CL), increased pulmonary resistance (RL), mild hypotension, and bradycardia. The apnea occurred after ozone was inhaled for about 2 minutes and lasted approximately 1 minute. After a 30-60 minute recovery period, re-exposure to ozone failed to produce apnea although the other responses did occur. The apnea, hypotension, and bradycardia could be prevented with prior vagotomy. Pretreatment with compound 48/80 prevented apnea and hypotension, and lessened the degree of bradycardia produced by ozone. Neither prior vagotomy nor pretreatment with 48/80 prevented the decrease in CL or the increase in RL. It is suggested that acute exposure to high concentrations of ozone releases histamine in the lung and thus leads to apnea, hypotension, and bradycardia via a vagal reflex. Decreases in CL and increases in RL were probably partly due to direct effects of ozone on the airways. (Author abstract modified)

16066

Toothill, C.

THE CHEMISTRY OF THE IN VIVO REACTION BETWEEN HEMOGLOBIN AND VARIOUS OXIDES OF NITROGEN. Brit. J. Anaesthesia, vol. 39:405-412, May 1967. 29 refs.

Nitric oxide reacts with hemoglobin in the same way as oxygen and carbon monoxide to form a ligand to the iron atom. The methemoglobin formation during the administration of nitric oxide and nitrogen dioxide in the concentration range 0.1-2% to anesthetized dogs was investigated. Massive conversion of oxyhemoglobin to methemoglobin was found in a series of anesthetized dogs exposed to 2% nitric oxide or nitrogen dioxide. One hundred percent conversion occurred in one case. Less marked changes occurred with inspired concentrations in the range 0.1-0.5%. Reduction in oxygen capacity contributed to the death of some of the dogs. Almost complete reconversion to oxyhemoglobin was accomplished with the administration of methylene blue. In all eight dogs, the only abnormal pigment found was methemoglobin. Nitric oxide-hemoglobin and nitric oxide-methemoglobin are unlikely products of the in vivo

reaction of nitric oxide and hemoglobin according to literature. Since no nitric oxide-hemoglobin was formed, it was supposed that the methemoglobinemia that is produced results from nitrite formed as a result of oxidation and hydration reactions.

16155

Krueger, A. P.

PRELIMINARY CONSIDERATION OF THE BIOLOGICAL SIGNIFICANCE OF AIR IONS. Scientiae, 54(689-690):460-476, Sept.-Oct. 1969. 34 refs.

The biological activity of air ions was investigated over a six-year period by observing changes in blood level of 5-hydroxytryptamine (serotonin-5HT) in mice during exposure to positive and negative charges of unipolar air. The experiments were conducted in plexiglas exposure chambers on which tritium-powered generators were mounted, equipped with a rectifying circuit for selection of ion change. When air ion densities were between 400,000-500,000 negative ions/cu cm, blood 5HT decreased. With equal concentrations of positive ions, blood 5HT increased. The experimental results are compatible with physical theories which indicate that specific physiological reactions are due to small air ions and predict that positive ionization of air containing water vapor results in the formation of the oxonium ion, H(+)(H2O), and the hydronium ion, (H3O)(+)(H2O)n while negative ionization produces O2(-)(H2O)n and OH(-)(H2O)n ions. These four ions are assumed to be responsible for the shifts in blood 5HT levels. Other experiments on the mechanisms of air ions are reviewed, and data on air ions are discussed in terms of their applications for the control of the individual living and working microenvironment, the treatment of disease, and the enhancement of food production.

16302

Guillerm, Roger, Rene Badre, Jean Hee, and Claude Bazouls

EFFECT OF LIGHT ATMOSPHERIC IONS ON THE CILIARY ACTIVITY OF THE TRACHEAL MUCOUS OF SHEEP AND RABBIT IN VITRO. (Effets des ions legers atmospheriques sur l'activite ciliare de la muqueuse tracheale de Mouton et de Lapin in vitro). Text in French. C R Acad. Sci., Paris, Ser. D, vol. 262:669-671, Feb. 7, 1966. 4 refs.

A section of sheep trachea, freshly excised and placed in a thermostatic environment, was swept by a 2 l/min current of water-saturated air. Ciliary activity was microscopically observed. Neither positive ions nor negative ions in this air current had any effect on ciliary vibration. Similar results were obtained with rabbit trachea.

16441

Inst. of Public Health, Tokyo, Japan

HEALTH ASPECTS OF AIR POLLUTION. In: Outline of Study of Air Pollution in Japan. Japan Air Pollution Panel, 2p., 1965. (Presented at the U. S. - Japanese Conference on the Development and Utilization of Natural Resources, 1965.)

Studies being conducted on the diffusion of air pollution, measurement methods, monitoring methods, and the effects of air pollution on human health were reviewed. An automatic filter paper sampler was invented to measure and monitor pollutants. The relationship between changes in air pollution and wind velocity and solar radiation and between vertical distribution of pollutants and meterological conditions were investigated. Experiments were conducted on dogs to determine the effects of sulfur dioxide and nitrogen dioxide on respiratory function. It was observed that SO2 in low concentrations has only an irritant effect, but NO2 in low concentrations affects the respiratory system. An epidemiological study was conducted on school pupils in Tokyo. The results showed that there is an increase in respiratory flow resistance in pupils in polluted areas. The effects of pollutants on pulmonary mechanisms and hematology is being determined. The size-distribution of particle composition and the mutual effects among particles and gases are also being studied.

16515

Hylyi, M. F., D. O. Melnychuk, and M. D. Klymenko

EFFECTS OF SODIUM BICARBONATE, MN(2+), MG(2+) AND ZN(2+) ON THE INTENSITY OF THE RENEWAL OF PROTEINS, GLYCOGEN AND LIPIDS IN THE LIVER AND MUSCLES IN RABBITS. (Vplyv biokarbonatu natriiu, Mn(2+), Mg(2+) i Zn(2+) na intensyvnist onovlenniia bilkiv, hlikohenu ta lipidiv u pechintsi ta m'iazakh kroliv). Ukr. Biokhim. Zh., 40(2):167-172, 1968. 19 refs. Translated from Ukranian. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 9p., Sept. 15, 1969.

Studies of the influence of sodium bicarbonate and the bivalent metal ions Mg(2+), Mn(2+), and Zn(2+) substances favorable to CO2 fixation processes in animal tissue, on the intensity of the renewal of proteins, glycogen, and lipids of the liver and muscles of rabbits are reported. Male rabbits were fed a diet of sodium bicarbonate and sulfuric acid salts of the indicated metals for ten days. The diet caused no noticeable changes in the interrelation of dry substance, lipids, glycogen, and proteins in the liver and muscle tissues. Among changes in the intensity of metabolic processes in substances was the considerable removal of carbohydrates in liver and muscles; this was manifested by the rapid inclusion of acetate-2-C 14 in glycogen and its exclusion. There was a considerable activation of the inclusion of radioactive carbon the tissue proteins, especially in muscle

protein. It is concluded that the stimulation of carboxylation processes visibly activates the renovation of carbohydrates and the intensity of the incorporation of radioactivity of protein. Lipid metabolism is influenced to a lesser degree.

16520

Speizer, Frank E. and Gary L. Huber

SOME PHYSIOLOGIC, BIOCHEMICAL AND CELLULAR RESPONSES OF THE LUNG TO AIR POLLUTANTS. Milbank Mem. Fund Quart., 47(5):256:268, July 1969. 28 refs.

Applied physiologic experiments in the laboratory animal and man can demonstrate the acute effects of pollutants; but they are difficult to relate to the development of chronic human respiratory disease secondary to environmental air pollution. Therefore, more fundamental approaches to the pathophysiologic mechanisms of the production of respiratory disease must be sought. The two air pollutants that have been studied at concentrations comparable to those found in the ambient air are ozone and nitrogen dioxide. These pollutants appear to injure the pulmonary parenchyma directly and to impair the mechanisms by which the lung inactivates and destroys inspired bacteria. The complex role of diminished clearance and recurrent infection in the role of chronic respiratory disease and the pulmonary pathology in man associated with high levels of exposure must involve some breakdown in the host defense mechanism. The alveolar macrophage has been implicated as the key factor in the maintenance of the integrity of the host defense mechanism. In experimental animals, significant structural changes in the pulmonary alveolar macrophage have followed exposure to one ppm ozone; these alterations appear to correlate well with alterations in functions. It is hoped that studies of low levels of pollutants, combined with a multidisciplinary approach to basic biological phenomena, will yield some insights into the development of chronic respiratory disease.

16542

Saruta, Namio, Nobuo Ishinishi, Yasushi Kodama, and Eizaburo Kunitake

EFFECTS OF GASEOUS POLLUTANTS ON HUMAN HEALTH. (Yugai gasu ni yoru taiki osen no jintai ni oyobosu eikyo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(7):445-450, Aug. 15, 1966. 12 refs.

In London, the average daily death rate has increased 1.3- to 2.6-fold on days of dense smogs. For instance, the death rate during the smog episode of 1952 was 2.6 times higher than average. About 6000 persons, mostly over 40, who had chronic respiratory difficulties were affected by the smog. The symptoms they exhibited were severe cough, throat pain, labored respiration, harsh voice, fever, headache, and vomiting. The

death rate due to air pollution in London or other northern European countries is of particular interest because heavy smoggy days are frequently characterized by the absence of wind. This has not been the case in Japan. A comparative medical survey of industrial and rural areas showed a higher incidence of respiratory organ disease and lung cancer than in industrial areas. Though suggesting that lung cancer has a close relationship with air pollution, the finding should be reconfirmed in connection with cigarette smoking, since 3,4-benzpyrene, supposedly responsible for causing lung cancer, is contained in both smoke dust and cigarette smoke.

16606

Shiel, F. O'M.

MORBID ANATOMICAL CHANGES IN THE LUNGS OF DOGS AFTER INHALATION OF HIGHER OXIDES OF NITROGEN DURING ANAESTHESIA. Brit. J. Anaesthesia, vol. 39:413-424, May 1967. 13 refs.

Twelve dogs were anesthetized with pentobarbitone and exposed to nitric oxide and nitrogen dioxide. Three dogs recovered. One dog was sacrificed after 24 hours and the other two were sacrificed after 48 hours. Autopsy was performed and the pathological changes of the lungs were described in detail. Changes in the lungs included edema, focal collapse and hyperinflation, diffuse and focal intravascular congestion, desquamation of bronchiolar mucosa, intra-alveolar hemorrhage, focal inflammatory and mucosal cell plugging of bronchioles, hyperplasia and regeneration of terminal bronchiolar mucosa, cellularity and necrosis of alveolar walls, intra-alveolar and peribronchial histiocytes, and focal and bronchopneumonia. Generally, the severity of the lesions was a function of the duration and concentration of the gaseous exposure. The most severe effects were seen in two of the surviving dogs. The acutely lethal exposure appeared to lie between 22 and 35 minutes at a concentration of 0.5% nitrogen oxide. While metabolic alterations are of primary relevance to the deaths of the non-surviving dogs, the pathological features were apparently the acute results from highly irritant gases. The areas of alveolar hyperinflation tended to occur adjacent to these lesions and were attributed to an acute compensatory effect. In the surviving dogs, the florid inflammatory cellular response was an expected progression and there was no sign of secondary bacterial infection at the stage of examination. The possibility of local increase in irritant concentration was postulated on the basis that the nitrogen oxides form solutions of nitrous and nitric acids in quantity and concentration in those acini which first begin to flood with transudate. In addition, decreased or absent ventilation in the flooded alveoli will lead to capillary endothelial anoxic necrosis resulting in focal hemorrhage.

16613

Prys-Roberts, C.

PRINCIPLES OF TREATMENT OF POISONING BY HIGHER OXIDES OF NITROGEN. Brit. J. Anaesthesia, vol. 39:432-439, May 1967. 39 refs.

The main methods of treatment for patients exposed to the noxious effects of nitric oxide, nitrogen dioxide, or the fumes of nitric acid are outlined. High concentrations of nitrogen oxides cause reflex inhibition of breathing with laryngospasm. Intense cyanosis develops rapidly. Therefore, severe hypoxia may occur. There is a tendency for the ventilatory frequency to increase, and pulmonary edema may occur in the acute phase. Oxygen therapy is recommended which consists of administering 100% oxygen, either by spontaneous or artificial ventilation in order to compensate for the decreased oxygen capacity and content of the arterial blood. Reconversion of methemoglobin by the use of methylene blue (2mg/kg) initially is advocated, with subsequent dosage titrated against the methemoglobin concentration in the blood. Prevention and treatment of chemical pneumonitis combines endobronchial and parenteral administration of corticosteroid preparations, together with bronchial lavage and suction. The metabolic component of acid-base derangement is corrected by intravenously administering sodium bicarbonate. Artificial ventilation by intermittent positive pressure ventilation may be indicated in patients who demonstrate ventilatory failure manifested by a rising arterial carbon dioxide pressure. Circulatory therapy is accomplished by the use of vasopressor agents to combat severe systemic hypotension. Associated drug therapy using dimercaprol is advocated in severe cases in view of the protective action of this type of agent against the higher nitrogen oxides. Bronchodilators may be indicated in order to alleviate bronchospasm arising from the irritant effects of the inhaled gases. (Author conclusions modified)

16614

Greenbaum, R., J. Bay, M. D. Hargreaves, M. L. Kain, G. R. Kelman, J. F. Nunn, C. Prys-Roberts, and K. Siebold

EFFECTS OF HIGHER OXIDES OF NITROGEN ON THE ANAESTHETIZED DOG. Brit. J. Anaesthesia, vol. 39:393-404, May 1967. 19 refs.

The physiological derangements during and after the administration of nitrogen oxides were studied in dogs anaesthetized with pentobarbitone. The dogs were exposed to concentrations of nitric oxide or nitrogen dioxide between 0.1-2.0% over 5-136 minute periods. Despite the inhalation of 98% oxygen, death was always associated with a critical reduction in arterial oxygen content. However, the mechanism of the hypoxemia varied between one dog and another. Three mechanisms were distinguished. Methemoglobinemia caused a reduction in blood oxygen capacity which was incompatible with life in certain dogs. Low arterial

P(02) was sufficient to cause a serious and probably lethal reduction of arterial oxygen content in some dogs, even if the pH was normal and methemoglobinemia was absent. Low arterial pH played an important part in the causation of diminished arterial oxygen content. At normal arterial P(02), a moderate acidemia does not cause significant desaturation because of the flatness of the oxyhemoglobin dissociation curve in that region. However, if the arterial P(02) is within the range of 15-30 mm Hg where the oxyhemoglobin dissociation curve is steep, a moderate acidemia causes a marked, and possibly critical, reduction of arterial saturation and content. The reduction of arterial P(02) was caused by an outpouring of fluid into the alveoli. The causation of alveolar flooding may be related to both passive transudation and the cellular response to the acid formed by the action of nitrogen dioxide on the alveolar lining fluid.

16661

Sherwin, Russell P., Valda Richters, Marcia Brooks, and Ramon D. Buckley

THE PHENOMENON OF MACROPHAGE CONGREGATION IN VITRO AND ITS RELATIONSHIP TO IN VIVO NO2 EXPOSURE OF GUINEA PIGS. Lab. Invest., 18(3):269-277, 1968. 27 refs.

Cultures of lung tissue from 23 guinea pigs exposed to low level nitrogen dioxide (10 ppm) and 31 control guinea pigs were evaluated for macrophage congregation, a phenomenon defined as the presence of three or more 'spread' macrophages on a single epithelial cell. There were about 63% more instances of this phenomenon in the exposed group than in the controls, 7.6% vs. 4.5%. The number of macrophages participating in each instance of congregation was also much greater in the exposed group. Congregation apparently represents a special role of the macrophage in the defense system in response to a variety of organisms, including infectious organisms, as judged by a high response in a pneumonia-affected control group. The tissue damage incurred cannot be considered specific for NO2 since it involved control as well as exposed cultures, and not all ambient pollutants were filtered out of the air supply system. Evidence is cited strongly indicating an important role for the macrophage in immunopathologic reactions independent of conventional antibody responses, and a close relationship among NO2 exposure, bacterial infection, and macrophage response. (Author abstract modified)

16705

Pace, Donald M., Paul A. Landolt, and Byron T. Aftonomos

EFFECTS OF OZONE ON CELLS IN VITRO. Arch. Environ. Health, 18(2):165-170, Feb. 1969. 16 refs.

Even low concentrations of O3 (4 ppm) appear to retard cell proliferation and interfere with mitotic activity. The effect

of O3 seems to depend not only upon concentration of the gas and length of exposure, but also upon cell density: The greater the numbers, the greater the resistance. It is probable that O3 may damage the cell membrane, as is shown by the increased vacuolar content and consequent "swelling" of the cells. Furthermore, it alters the collagenous-like substance by means of which cells attach themselves to the substratum so that they tend to become detached. Results also suggest that cells in vitro may develop a tolerance to O3. No explanation can be given at present but the possibility suggested by Stokinger, the stimulation of activity of the pentose phosphate pathway, could apply. (Author's Abstract)

16707

Blair, William H., Mary C. Henry, and Richard Ehrlich

CHRONIC TOXICITY OF NITROGEN DIOXIDE. II. EFFECT ON HISTOPATHOLOGY OF LUNG TISSUE. Arch. Environ. Health, 18(2):186-192, Feb. 1969. 9 refs.

Mice were exposed to 0.5 ppm nitrogen dioxide (NO2) for 6, 18, and 24 hrs. daily. The lung alveoli were expanded in all mice exposed to NO2 from three to twelve months, with the highest degree of involvement at 12 months; thus the number of expanded alveoli appeared to increase with exposure time. The general impression was of early bronchiolar inflammation with reduction of distal airway size and a concomitant expansion of alveoli. The overall lesions appeared to be consistent with the development of early focal emphysema. Examination of the heart, liver, kidney, and spleen did not reveal any unique pathology. Mice exposed to NO2 and challenged with Klebsiella pneumoniae exhibited a marked reduction in functional lung tissue. (Author's Abstract)

16738

Vaughan, Thomas R., Lesta F. Jennelle, and Trent R. Lewis

LONG-TERM EXPOSURE TO LOW LEVELS OF AIR POLLUTANTS. Arch. Environ. Health, 19(1):45-50, July 1969. 29 refs.

One hundred and four beagles have been exposed for 18 months to natural and photochemically reacted auto exhaust, oxides of nitrogen and oxides of sulfur. No differences in single-breath carbon monoxide diffusing capacity, dynamic pulmonary compliance, or total expiratory pulmonary resistance were found between exposed and control animals. Removal of reactive gases in the upper airway was studied during brief exposures in an additional small group of animals. Under these conditions, 100% removal of O3 and SO2, 90% removal of NO2, 73% removal of NO, and no removal of CO or hydrocarbon were found. (Author's Abstract)

16739

Stokinger, Herbert E.

THE SPECTRE OF TODAY'S ENVIRONMENTAL POLLUTION--USA BRAND: NEW PERSPECTIVES FROM AN OLD SCOUT. Am. Ind. Hyg. Assoc. J., 30(3): 195-217, May 1969. 128 refs.

A comprehensive toxicologic evaluation of the potential human health hazards from man-made and natural environmental pollutants (except radiation) from air, water and food has been made to highlight the areas of greatest concern for health agencies in the U.S.A. The judgments are predicated on pollutant levels existing now or in the foreseeable future, and on the hereditary milieu of the population of the continental United States. (Author's Summary)

16742

Cassell, Eric J.

THE RIGHT TO A CLEAN ENVIRONMENT. Arch. Environ. Health, 18(5): 839-843, May 1969.

Since the Donora, Pa. smog in 1948, research aimed toward understanding the health effects of air pollution has increased. Substances in the atmosphere have been investigated one by one for their effect on both man and animals. Although experimental evidence supporting a relationship between specific pollutants and any index of disease is sparse, clues to the existence of some causal relationships are often observed. The synergistic action between SO2, H2SO4, and certain animals has been clearly demonstrated. Similar examples of synergism can be hypothesized or demonstrated in the complex chemical system that is the atmosphere. There is now recognition of the need for consideration of the total environment when establishing standards and criteria. The attitudes of society and of science are changing so that now, although control of SO2 and particulates appears probable, a more comprehensive view of the problem will be required.

16780

Peak, M. J. and William L. Belser

SOME EFFECTS OF THE AIR POLLUTANT, PEROXYACETYL NITRATE, UPON DEOXYRIBONUCLEIC ACID AND UPON NUCLEIC ACID BASES. Atmos. Environ., 3(4):385-397, July 1969. 19 refs.

Some reactions between the air pollutant peroxyacetyl nitrate (PAN) and isolated bacterial deoxyribonucleic acid (DNA) are presented. PAN causes a reduction in genetic transforming activity, melting temperature and viscosity of the DNA. PAN also reduces the infectivity of bacteriophage. It is shown

that the intensity and type of reaction is pH dependent, and that the reaction depends upon the presence of a rapidly dissipated transient molecule produced from PAN as it enters solution. Furthermore, PAN modifies some nucleic acid bases, when freshly gassed into aqueous solutions of the base. The susceptibility sequence to PAN attack is thymine, guanine, uracil, cytosine, adenine. No reaction was detected above pH 5, and the reaction rate increases as the pH is lowered. One of the reaction products is CO2, which is excised from the 2-carbon of thymine. This reaction predominates at pH 4, whereas at pH 2 at least 5 reaction products are produced, including CO2. (Author's Abstract)

16794

McMillan, Russell S., Daniel H. Wiseman, Bernard Hanes, and Paul P. Wehrle

EFFECTS OF OXIDANT AIR POLLUTION ON PEAK EXPIRATORY FLOW RATES IN LOS ANGELES SCHOOL CHILDREN. Arch. Environ. Health, 18(6): 941-949, June 1969. 10 refs.

Lung function of two samples of Los Angeles elementary school children was assessed twice monthly for 11 months by two examiners using the peak flowmeter. The two samples of children were located in areas with different average levels of oxidant air pollution. No significant changes in peak expiratory flow rate (PEFR) were found which correlated with acute changes in air pollution. Higher PEFR means and greater variance were found in the school exposed to higher ambient oxidant concentrations. These differences may have been related to the difference in the frequency of upper respiratory infections in the two groups. (Author's Summary)

16830

Wolkonsky, Peter Malia

PULMONARY EFFECTS OF AIR POLLUTION. Arch. Environ. Health, 19(4): 586-592, Oct. 1969. 35 refs.

Current research on pulmonary effects of air pollution is reviewed. The roles of particulates (benign or pathogenic), carbon monoxide, sulfur oxides, nitrogen oxides and oxidants are discussed. Synergism, epidemiology, and pathology are other featured topics. Much useful, though often puzzling, information is being gained on the pulmonary effects of various pollutants. It appears that, if action is to be taken to curb air pollution, it will have to be done in part on the basis of intuition and extrapolation from current research results.

16840

Wright, George W.

AN APPRAISAL OF EPIDEMIOLOGIC DATA CONCERNING THE EFFECT OF OXIDANTS, NITROGEN DIOXIDE AND HYDROCARBONS UPON HUMAN POPULATIONS. J. Air Pollution Control Assoc., 19(9):679-682, Sept. 1969. 14 refs.

Eye irritation is related to sudden increases in the concentration of oxidants, carbon monoxide, aldehyde, and particulates but not to nitrogen dioxide. The respiratory system of healthy persons has not been demonstrated to react to any of these agents at the concentrations thus far reported in community air. There is some evidence that oxidants at levels found in community air aggravate the symptoms and airway resistance of persons who have preexisting chronic obstructive lung disease. The existing evidence does not support the belief that this type of aggravation accounts for fluctuations of mortality in the general population. There are no data upon which to base a judgment of whether or not oxidants, nitrogen dioxide, or hydrocarbons at levels now existing in community air play any role in causation of respiratory disease. (Author's Abstract) This article is followed with a discussion by Robert M. Albrecht.

16905

Holzman, R. S., D. E. Gardner, and D. L. Coffin

IN VIVO INACTIVATION OF LYSOZYME BY OZONE. J. Bacteriol., 96(5): 1562-1566, Nov. 1968. 12 refs.

The effect of exposure of oxidant air pollutants on pulmonary lysozyme in mice and rabbits was studied. Acute exposure of mice or rabbits to ozone reduced the amount of active lysozyme obtained by bronchopulmonary lavage. The effect was proportional to ozone concentration, as well as to the duration of exposure. After 3 hr at 5 ppm, activity decreased approximately 30%. These findings were confirmed in rabbits exposed to 10 ppm ozone for 3 hr. Under these conditions, a 65% reduction in lysozyme was observed. Forty mice were exposed to 5.5 ppm of O2 for 3 hr and sacrificed immediately and at 3 hr intervals thereafter. After 12 hr, extractable lysozyme returned to approximately pre-exposure levels. Mice exposed to 30 ppm nitrogen dioxide for 3 hr showed no change in extractable lysozyme activity. This failure of NO2 to react with lysozyme in the lungs of exposed animals was duplicated. Studies of the release of lysozyme by alveolar cells support the theory that loss of activity is due to in vivo oxidation of lysozyme.

16907

Albright, Randall L. and John A. Babett

POISONOUS EFFECTS OF THE IMPURITIES OF NITROUS OXIDE. J. Oral Surg. Anesthesia Hosp. Dental Serv., vol. 26:1643-1645, Oct. 1968. 2 refs.

Contaminants of nitrous oxide create poisonous effects; proper treatment requires a knowledge of the chemistry involved, its effect on systems, and diagnosis. The formation of nitrous oxide is usually accomplished by heating ammonium nitrate. Contamination may occur from NO, NO2, and N2. If any NO proceeds through the filtering process, it becomes liquid, along with any N2O in the tanks. Since NO is about 30 times more volatile than N2O, it will be the first gas to be let off from the tank. Under normal temperatures, such as during the administration of an anesthetic, nitric oxide may react with oxygen to form nitrogen dioxide which is involatile. Although a given tank may be contaminated with NO, the abundant supply of O2 in the system may actually cause the patient to be poisoned by NO2. The effects of the inhalation of 0.5-2.0% NO or NO2 for five to ten minutes were described. Formation of methemoglobin appears to be one of the greatest problems. This is followed by a drastic fall in PO2, increased PCO2, and a resultant drop in the pH of the blood. Poisoning of the respiratory system may result in hypoxia, hypotension, acidosis, and death. Intense cyanosis may also occur. Treatment includes oxygenation of the patient using 100% oxygen, reconverting methemoglobin with intravenous methylene blue, restoring acid-base balance with intravenous sodium bicarbonate, and the use of vasopressors to combat severe hypotension. Chemical pneumonitis may be treated by bronchial lavage of a basic medium such as corticosteroids. Disulfide and sulfydrite groups are used to combat the effects of poisoning, and bronchodilators may also be used to alleviate bronchospasm.

16916

Alpaugh, E. L., K. A. Phillippe, and H. C. Pulsifer

VENTILATION REQUIREMENTS FOR GAS-METAL-ARC WELDING VERSUS COVERED-ELECTRODE WELDING. Am. Ind. Hyg. Assoc. J., 29(6):551-557, Nov.-Dec. 1968. 6 refs.

Comparative tests were undertaken of the amounts of particulate and gaseous byproducts generated by gas-metal-arc welding and covered-electrode welding processes to determine if the same ventilation requirements apply to both processes. Solenoid values set for inhalation and exhalation times observed in the normal adult male were used to stimulate breathing by a plaster dummy head mounted on a movable welding head carriage. Air samples were taken concurrently inside and outside the welding helmet worn by the dummy. Samples were analyzed for iron oxide, nitrogen dioxide, ozone, fluorides, and carbon monoxide. The gas-metal-arc welding process was represented by five wire electrodes, three of which were flux-cored, and five shielding gases. A standard covered electrode was used for comparison purposes. Contaminant levels generated by the two processes were comparable, and it is concluded that more stringent regulations for either process would be unreasonable. In addition, the study offers evidence that the welding helmet is an effective barrier against the particulate and gaseous byproducts. Consequently, air samples taken adjacent to the helmet yield exaggerated exposure results in welding surveys. Contaminant concentrations are tabulated.

16948

Gottlieb, Sheldon F. and Stephen V. Savran

NITROUS OXIDE INHIBITION OF SODIUM TRANSPORT. Anesthesiology, 28(2):324-326, March-April 1967. 11 refs.

Sacs made of inverted frog skin were filled with an electrolyte solution and exposed in a pressure chamber to nitrogen or nitrous oxide with a small concentration of oxygen. Changes in sodium ion concentration were measured after 20 to 22 hours. With increasing concentrations of nitrous oxide in the range of 100 to 200 psig., inhibition of sodium transport increased. Inhibition of sodium transport was shown not be to due to pressure per se since 175 psig. nitrogen did not result in inhibition. Inhibition of sodium transport paralleled previcus reports of nitrous oxide depression of nerve excitability. (Author abstract modified)

17027

Yokoyama, Eiji

UPTAKE OF SO2 AND NO2 BY THE ISOLATED UPPER AIRWAYS. Koshu Eiseiin Kenkyu Hokoku (Bulletin of the Institute of Public Health), 17(4):302-306, 1968. 9 refs.

The penetration rates of sulfur dioxide and nitrogen dioxide in the respiratory system were studied by isolating the upper airways of two dogs and three rabbits anesthetized with intravenous pentobarbital sodium. The airway of nose, pharynx, larynx, and the uppermost trachea were isolated from the remainder of the respiratory system by fitting a glass mask to an animal's head. The mask was connected to a glass cannula through which the gases were sucked in for 10-15 min. The rate of uptake was found to be nearly constant during the period of gas passing and 99.7% for 7-87 ppm SO2 and 4-41% ppm, NO2. The differences in the rate of uptake may partly explain the different responses in the ventilatory functions of experimental animals exposed to SO2 and NO2. (Author abstract modified)

17055

Yokoyama, Eiji

EFFECT OF EXPOSURE TO THE MIXTURE OF SO2 AND NO2 ON VENTILATORY FUNCTIONS OF GUINEA PIGS. Koshu Eiseiin Kenkyu Hokoku (Bulletin of the Institute of Public Health), 17(4):315-321, 1968. 13 refs.

Six guinea pigs, 280 g-440 g in body weight, were exposed to mixtures containing 18 ppm sulfur dioxide-17 ppm nitrogen dioxide and 37 ppm SO2-32 ppm NO2 and studied for the effects of exposure on their ventilatory function (flow resistance of the lung plus thorax, tidal volume, and respiratory rate). No significant

changes were observed in either respiratory rate or tidal volume. In general, the time course of respiratory rate and tidal volume changes was midway between that caused by exposure to the individual gases, which brought about statistically significant percent changes. The results are discussed in terms of complicated interactions between flow resistance, compliance, and lung air volume. It is hypothesized that SO2 and NO2 in combination exert their action independently at different lung sites, with changes in flow resistance determined chiefly by the component SO2. Below a certain level, a mixture may cause fewer overall changes than individual gases. Beyond a certain level, a mixture may become lethal in short intervals of exposure. As a result of exposure to 50 ppm SO2-50 ppm NO2, all animals died from pulmonary hemorrhage. None had died during exposure to 50 ppm SO2 or NO2 alone. (Author abstract modified)

17056

Yokoyama, Eiji

COMPARISON OF THE VENTILATORY EFFECTS ON GUINEA PIGS OF EXPOSURE TO SO2 AND NO2. Koshu Eiseiin Kenkyu Hokoku (Bulletin of the Institute of Public Health), 17(4):307-314, 1968. 26 refs.

Quantitative measurements of ventilatory function of guinea pigs were made before, during, and after two-hr exposure to 6 to 90 ppm of sulfur dioxide and 6 to 57 ppm of nitrogen dioxide. A significant increase in the respiratory (lungs plus thorax) flow resistance was caused by exposure to both gases; the rate of increase was generally higher for SO2 than for NO2. However, the direction of respiratory rate response was quite different at concentrations above 6 ppm; it decreased following SO2 exposure and increased following NO2 exposure. A similar pattern was observed for tidal volume response. Five of the 15 guinea pigs exposed to 57 ppm of NO2 died from lung hemorrhage within 48 hrs after exposure. It is suggested that the differences in the ventilatory effects of SO2 and NO2 are due to the gases reaching different areas of the lungs. Within the range of concentrations studied, it appears that NO2 penetrates deep into the lungs, causing a decrease in compliance and a smaller increase in flow resistance. Sulfur dioxide, being taken up by the mucosa of the airway before reaching the peripheral portion of the lungs, could cause increased flow resistance without a significant change in compliance. (Author abstract modified)

17061

Yokoyama, Eiji

EFFECTS OF ACUTE CONTROLLED EXPOSURE TO NO2 ON MECHANICS OF BREATHING IN HEALTHY SUBJECTS. Koshu Eiseiin Kenkyu Hokoku (Bulletin of the Institute of Public Health), 17(4):337-346, 1968. 34 refs.

The effect of short term exposure to 2.7, 6.2, 12.6, and 16.9 ppm concentrations of nitrogen dioxide on the mechanics of breathing

was studied in eight healthy males from 18 to 37 years of age. The subjects were seated in a volume-displacement body plethysmograph and exposed to each concentration for 10 min. Pulmonary flow resistance, pulmonary compliance, and functional residual capacity was measured before, during, and after each exposure period. No subject showed a significant change in flow resistance after exposure to 2.7 ppm; the average increase in flow resistance became significant only at 16.9 ppm. Recovery of the average flow resistance observed at 16.9 ppm was essentially complete 10 min after exposure ended. Combined data on 16.9 and 12.6 ppm exposures showed that the significant increase in flow resistance occurred within 5 min of the onset of exposure. No subject showed a significant reduction in pulmonary compliance. Similarly, functional residual capacity, respiratory rate, tidal volume, and pulse rate were found to be unaffected by all concentrations. Atropine, 0.7 mg in dose, administered subcutaneously prior to exposure did not inhibit the increase of flow resistance. No difference was found between response to NO2 alone or in combination with a submicronic NaCl aerosol. (Author abstract modified)

17072

Bruchhausen, Dieter, Georg Geissler, and Jamil Haschem

ON THE INACTIVATION OF THE DOMESTIC DUST ALLERGEN BY UV-IRRADIATION. (Ueber Inaktivierung des Hausstauballergens durch UV-Bestrahlung). Text in German. Z. Immunitaltsforsch. Allerg Klin. Immunol., 138 (5):434-438, Nov. 1969. 1 ref.

Extracts from bed feathers, mildew, mixed sorts of flowers, pollen, and domestic dust with and without phenol were exposed to UV-radiation. The domestic dust extracts were irradiated for 30, 60, 90 and 120 minutes. After irradiation, allergic test persons received an interdermal injection of 0.02 ml of the extract. UV-radiation influenced solely the domestic dust extract. The erythema developing after injection were clearly smaller. In a second series of experiments, the influence of UV-radiation on phenol containing domestic dust was studied. Already 30 min of UV-radiation reduced the erythema developing after intradermal injection. Since the same results were obtained with phenol containing as well as with phenol lacking domestic dust, it can be assumed that inactivation of the allergen is not due to the phenol. Rather, it is the irradiate energy which is absorbed by the allergen which changes the molecular structure of the latter, reducing the allergenic effect.

17311

Yokoyama, Eiji

COMPARISON OF THE VENTILATORY EFFECTS OF SO2 AND NO2 - EXPOSURE OF HUMAN VOLUNTEERS. (SO2 oyobi NO2 no kankino ni oyobosu eikyo no hikaku - hito shigansha ni okeru bakuro jikken). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 12(1):4-8, Jan. 20, 1970. 20 refs.

Respiratory mechanisms were studied in eight healthy male volunteers during and following exposure to 36 ppm sulfur dioxide or 15 ppm nitrogen dioxide. An esophagus balloon was inserted through the nose of each subject who was seated in a body plethysmograph. A Dubois pressure type plethysmograph was employed for SO2 exposure, and a Mead variable volume type 71-Krogh spirometer for NO2 exposure. In both cases, the mean value of the pulmonary flow resistance increased significantly at the end of the exposure. No significant difference was observed in other measures of respiratory mechanisms except for one subject, no difference was seen between responses to SO2 and NO2. Additional groups of subjects were exposed to SO2 and NO2 with or without pre-treatment with atropine sulfate. The atropine markedly inhibited the increase in the pulmonary flow resistance during exposure to SO2, but not during exposure to NO2. The result suggests, as regards the cause of airway narrowing, that reflex bronchoconstriction plays a role in the exposure to SO2, while other mechanisms are also involved in the case of NO2.

18031

Weissbecker, Ludwig, Robert D. Carpenter, Peter C. Luchsinger, and Thomas S. Osdene

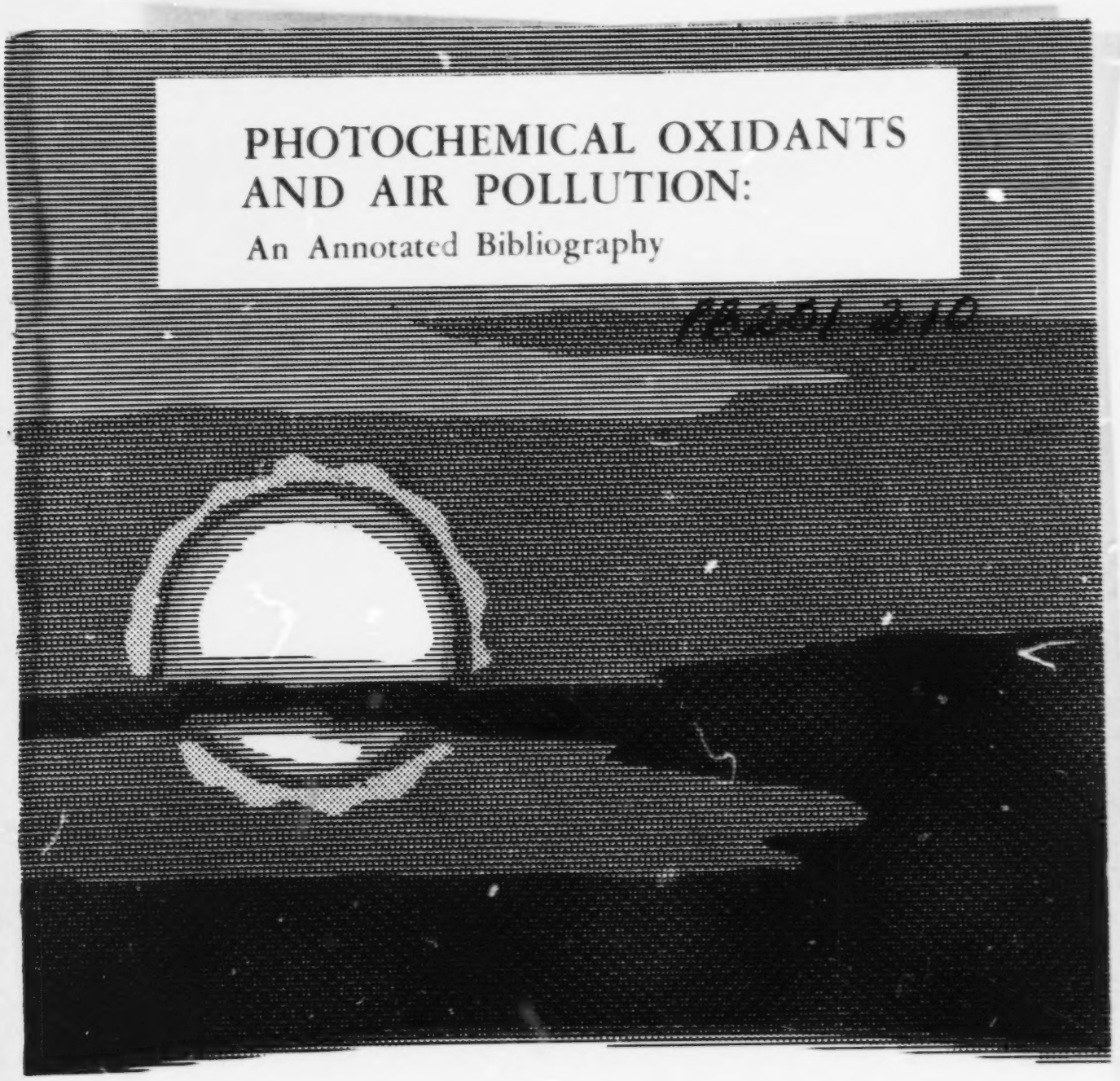
IN VITRO ALVEOLAR MACROPHAGE VIABILITY. EFFECT OF GASES. Arch. Environ. Health, 18(5):756-759, May 1969. 11 refs.

A simple, rapid method was developed for the determination of in vitro alveolar macrophage viability after exposure to gases. Air pollutants such as ozone, sulfur dioxide, and oxides of nitrogen killed alveolar macrophages, as determined by the dye exclusion test. O3 was effective at very low concentrations. Other gases such as CO2, CO, CH4, CH3Cl, acrolein, acetaldehyde, acetone, isoprene, benzene, and HCN had no effect on cell viability. (Author's Abstract)

* U. S. GOVERNMENT PRINTING OFFICE : 1971 O - 422-893

PHOTOCHEMICAL OXIDANTS AND AIR POLLUTION:

An Annotated Bibliography



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PART 2. CATEGORIES G THROUGH N AND INDEXES

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PHOTOCHEMICAL OXIDANTS AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY PART II.

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Air Pollution Control Office
Research Triangle Park, North Carolina
March 1971

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Air Pollution Control Office Publication No. AP-88

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G. EFFECTS – PLANTS AND LIVESTOCK

00009

O. C. Taylor

"OXIDANT" AIR POLLUTANTS AS PHYTOTOXICANTS. California Univ., Riverside, Air Pollution Research Center. (Paper 64-91). 1964. 13 pp.

This report attempts to outline some of the advances made in the identification and study of oxidizing toxicants other than ozone in the "smog" complex and to indicate some of the avenues of research that are prerequisites to the establishment of effective control measures. Assuming that the total elimination from the atmosphere of oxidant-forming pollutants is not economically feasible, it is essential that investigations be continued to determine acceptable levels of the pollutants, to find resistant plant materials and to search for chemical additives that might offer protection to the vegetation.##

00087

A.P. Bush, R.A. Glater, J. Dyer, G. Richards

THE EFFECTS OF ENGINE EXHAUST ON THE ATMOSPHERE WHEN AUTOMOBILES ARE EQUIPPED WITH AFTERBURNERS. California Univ., Los Angeles, Dept. of Engineering. (Rept. No. 62-63.) Dec. 1962. 38 pp.
CFSTI, DDC: AD 297976

In order to determine the probable composition of the atmosphere after automobile exhausts are controlled, tests were conducted using the air pollution test facility on the campus at UCLA. Automotive vehicles were studied with and without afterburners using various concentrations of auto exhaust during simulated driving cycles. The objective of the experimentation was to simulate ambient atmosphere and to test this atmosphere for contamination by exposing known sensitized plants to it and testing its ability to produce human eye irritation. Indications are that atypical plant damage reported is due to oxides of nitrogen: Fumigations showed that, in all instances of elevated formaldehyde measurements, eye irritation resulted.##

00121

W. W. Heck, J. A. Dunning, and I. J. Hindawi

OZONE: NONLINEAR RELATION OF DOSE AND INJURY IN PLANTS. Science 151, (3710) 577-8, Feb. 4, 1966.

Ozone produces a sigmoidal dose-injury response in sensitive

G. EFFECTS – PLANTS AND LIVESTOCK

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O. C. Taylor

"OXIDANT" AIR POLLUTANTS AS PHYTOTOXICANTS. California Univ., Riverside, Air Pollution Research Center. (Paper 64-91). 1964. 13 pp.

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00087

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00121

W. W. Heck, J. A. Dunning, and I. J. Hindawi

OZONE: NONLINEAR RELATION OF DOSE AND INJURY IN PLANTS. Science 151, (3710) 577-8, Feb. 4, 1966.

Ozone produces a sigmoidal dose-injury response in sensitive

tobacco and pinto bean. A definite threshold concentration and presentation time are required before injury is initiated. (Author)##

00184

H. E. Heggestad, F. R. Burleson, J. T. Middleton, and E. F. Darley

LEAF INJURY ON TOBACCO VARIETIES RESULTING FROM OZONE, OZONATED HEXENE-1 AND AMBIENT AIR OF METROPOLITAN AREAS. Intern. J. Air Water Pollution 8, 1-10, 1964.

Six tobacco varieties representing a range in susceptibility to naturally occurring ozone fleck in field plots at Beltsville, Maryland, were: (1) fumigated with ozone, (2) fumigated with ozonated hexene-1, and (3) exposed to ambient air at Riverside, California. Prior to fumigation, all plants were grown in a greenhouse with carbon-filtered air. Injury caused by ozone to tobacco in fumigation studies could not be distinguished from naturally occurring fleck in fields at Beltsville. The susceptibility of the six varieties to ozone fleck was very similar at Riverside and Beltsville. When fumigated with ozonated hexene-1, however, the injury occurred only on lower leaf surfaces and the reactions of varieties were very different. Some injury to the lower leaf surface of young leaves, perhaps caused by peroxyacetyl nitrate (PAN) was noted when plants were exposed to unfiltered ambient air in a Riverside greenhouse. No injury occurred to any of the varieties of N. tabacum grown in the greenhouse with carbon-filtered air. The sequence of damage by ozone and ozonated hexene-1 was from oldest to youngest leaves. Ozone caused more damage to leaves at the bottom of the plant, whereas ozonated hexene-1 injury was more severe about mid-plant. Although ozone injury occurred on tobacco exposed to ambient air at Riverside and Beltsville, some differences in leaf damage and plant sensitivity at these two widely separated geographic locations are discussed. (Author)##

00229

J.T. Middleton A.J. Haagen-Smit

THE OCCURRENCE, DISTRIBUTION, AND SIGNIFICANCE OF PHOTOCHEMICAL AIR POLLUTION IN THE UNITED STATES, CANADA, AND MEXICO. J. Air Pollution Control Assoc., 11(3):129-134, Mar. 1961. (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

The cracking of rubber, production of elevated oxidant and the occurrence of both ozone and oxidant plant damage are shown to be manifestations of photochemical air pollution. Geographic areas considered are Los Angeles, San Francisco, Washington, D.C.; urban and non-urban areas.##

00232

C.C. Black, J.F. Turner, M. Gibbs, D.W. Krogmann, S.A. Gordon

STUDIES ON PHOTOSYNTHETIC PROCESSES. II. ACTION SPECTRA AND QUANTUM REQUIREMENT FOR TRIPHOSPHOPYRIDINE NUCLEOTIDE REDUCTION AND THE FORMATION OF ADENOSINE TRIPHOSPHATE BY SPINACH CHLOROPLASTS. J. Biol. Chem. 237, (2) 580-3, Feb. 1962

In this communication, the effect of monochromatic light on TPN reduction and the associated formation of ATP in the spinach chloroplast is described. Data are also presented on the effect of monochromatic light on the synthesis of ATP by the spinach chloroplast in the presence of phenazine methosulfate. (Author)##

00235

F.W. Oliver

ON THE EFFECTS OF URBAN FOG UPON CULTIVATED PLANTS. J. Roy. Hort. Soc. 16, 1-59, 1893. (The Second Report presented to the Scientific Committee of the Royal Horticultural Society, Feb. 14, 1893.)

Author discusses the effect of foreign material emissions associated with fog as they might cause damage to plants. The categories covered by author are: Remedial Measures to be Taken; Behavior of Different Classes of Plants (i.e. ferns, Monocotyledons, Dicotyledons); Effect of Reduced Illumination; Changes which the Chlorophyll Undergoes in Leaves Injured by Fog; Behavior of Flowers toward Fog and Certain of Its Ingredients; Action of Pyridine and of Allied Bodies; and Action of Pyridine and of Allied Bodies; and Action of Acid and Other Vapors.##

00244

H.W. Wolf

MICROORGANISMS AND OXIDIZING - TYPE AIR POLLUTION (DOCTOR'S THESIS). (For the degree of Doctor of Public Health, California Div. Los Angeles.) 1965. 119 pp.

The possibility that oxidizing-type air poullution might suppress the viability of bacterial cells was investigated. Sampling activities were conducted at the Azusa Station of the Los Angeles County Air Pollution Control District. Micoorganisms indigenous to the air of the area were sampled with an Andersen sampler. Bacteria and yeasts (together) recovered during high-oxidant periods (total oxidant = greater than 0.19 ppm) had a median equivalent diameter (MED) 0.3 microns

greater than those recovered during low-oxidant periods (total oxidant equal to or less than 0.19 ppm). This difference was not considered significant since wind velocity was higher during high-oxidant periods. Higher wind velocities effect a longer MED by increasing the relative concentration of large-sized particles. Although more organisms were recovered on the small stage during low-oxidant periods than during high-oxidant periods, the level of significance (0.85) is low. Further, it was speculated that sunlight might exert such an effect. Background studies showed gram-negative rods to be highly log-normal in size distribution, while gram-positive rods deviated from normality. This deviation of gram-positive rods was possibly due to the predominance of two morphological types, large spore-formers, and small non-spore-formers. Molds, including actinomycetes, were markedly non-normal in distribution. The highly log-normal distribution, and absence of spore-forming types, of the gram-negative rods deserve special attention from future investigators. A permeable-membrane technique was used to expose selected microorganisms to high-oxidant levels. (Author's abstract)##

00301

M. D. Thomas

GAS DAMAGE TO PLANTS. Ann. Rev. Plant Physiol. 2, 293-322, 1951.

A detailed review is given of gas damage to plants with references containing important bibliographies. Investigations on the effects on vegetation of sulfur dioxide, other sulfur-containing gases, halogens and hydrogen halides, nitrogen oxides, ammonia, mercury vapor, and carbon compounds are cited and results discussed. Phytotoxicities of the different gases seem to depend on (a) absorbability, which is related to water solubility and reactivity with the tissues; (b) acidity or alkalinity; (c) oxidation or reduction reactions; (d) hormonal properties; and (e) toxicity of the element itself. Carbon monoxide, hydrogen cyanide and hydrogen sulfide are of comparatively low toxicity. Greater toxicity is evidenced by chlorine and sulfur dioxide due to their rapid oxidizing or reducing properties. The even greater toxicity of fluorine and iodine compounds is due to their rapid absorption and inherent toxicity as elements in themselves.##

00315

THE SMOG PROBLEM IN LOS ANGELES COUNTY, LOS ANGELES.
J. Western Oil Gas Assoc. 70-1, 1954.

Close observations of damage in the field and comparisons with damage occurring in the unfiltered greenhouse were the basis of the studies of the various types of plant damage that occured in

the Los Angeles county area. After any one smog attack, practically all of the several types of damage could be observed, not only in a single field, but frequently even on a single plant. At times, on the other hand, only one leaf out of a dozen on one plant, or one plant in a row of plants, would be damaged. Similarly, although severe damage might occur in one field, adjoining fields and surrounding areas were sometimes free of damage.##

00316

A. R. Gregory

EFFECTS OF AIR POLLUTION ON EDIBLE CROPS. North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering. May 1964. pp. 21-3.

The effects of air pollution on edible crops should be differentiated at the onset from the effects of air pollution on vegetation in general. For example, sulfur dioxide has a very pronounced effect on pine needles, but pine needles are a minor food source. It has been variously estimated by different authorities that the annual loss of vegetable produce amounts to 40 to 60 million dollars. Although this over-kill type of damage is very real to the vegetable producer and is of great economic interest, it is of less concern to those in public health. Their concern is with the damage that alters the content s of crops but does not alter the appearance sufficiently to prohibit their sale. This results in threats to public health through the insidious route of the gastro-intestinal tract. The alterations in edible crops that are usually not apparent to the consumer fall into two categories: (1) loss of nutiirnts such as vitamins, proteins, essential fatty acids, etc. and (2) the addition of some substance to the food which is toxic when absorbed from the gastro-intestinal tract. The loss of nutrients has been established in many cases. Some of the substances which have been shown to produce nutrient damage to produce are: ozone, nitroolefins, perocyacyl nitrates, nitrogen oxides, and ethylene. Of probably greater importance to health now and assuredly in the future is the addition of some toxic substance to the produce. With the advent of possible atomic power plants, Be was studied for toxicity and found to be extremely toxic. It was found that Be taken up into bush beans was not only toxic itself, but decreased the Cu content. In this way it fell into the category of primary toxicant and also into the category of nutrient depletor. Many other compounds also fall into both categories. With the many new insecticides, herbicides and larvicides being manufactured, it has become imperative to be aware of the problem of both the effect on edibles of a toxicant and also its effect on the plant, that is, loss of minerals, vitamins, etc.##

00413

I.J. Hindawi, J.A. Dunning, C.S. Brandt

MORPHOLOGICAL AND MICROSCOPIAL CHANGES IN TOBACCO, BEAN, AND PETUNIA LEAVES EXPOSED TO IRRADIATED AUTOMOBILE EXHAUST. Phytopathology 55(1):27-30, Jan. 1965.

Tobacco, Pinto bean, and petunia plants were shown to be useful indicators of phytotoxicants produced from irradiated automobile exhaust. Four distinct response patterns were identified; these were considered indicative of 4 classes of toxicants present in the irradiated exhaust. Toxicants in class 1 caused injury primarily in palisade cells of young leaves. The upper leaf surface developed a water-logged appearance which turned to reddish-brown, then light to dark tan or bronze depending on environmental conditions. Toxicants of class 2 produced an undersurface glazing on young leaves; spongy parenchyma was typically affected. This pattern was similar to the "smog" injury of southern California. Toxicants of classes 3 and 4 injured the palisade cells, resulting in small dehydrated spots on the upper leaf surface. The 2 classes are distinguished from each other by the age of leaf tissue affected; class 3 is apparent on the newly expanded leaf, whereas class 4 is visible on mature to old leaves and is identical to ozone injury. Other injury patterns such as pigmentation, crinkling, and blistering may develop on the lower surface of young leaves 2-6 days after exposure to the exhaust.##

00433

S. Kotaka, A. P. Krueger and P. C. Andriese

SOME OBSERVATION ON AIR-ION-ENHANCED IRON CHLOROSIS IN BARLEY (HORDEUM VULGARIS) SEEDLINGS. Plant Cell Physiol. (Tokyo) Vol. 6:233-245, 1965.

The air ion effects on "active" and "residual" iron distribution in barley seedlings were studied in the course of the development of ironchlorosis in an iron-free culture medium. Active or "acid soluble" iron plays an important role for chlorophyll biosynthesis and is extractable with 1.0 normal HCl from dried tissues and "residual" or "acid insoluble" iron does not participate in this chlorophyll formation process and is not extracted with 1.0 normal HCl. Ions of either charge induced a significant decrease in active iron content which was associated with a decrease in chlorophyll content. Concomitantly, there occurred an increase in both the residual iron and the cytochrome c fractions. The increase in residual iron content may involve not only cytochrome c but also other cytochromes and iron-containing enzymeds as well. The authors have proposed a hypothesis that the site of air ion action in the experiments reported may be the regulatory systems controlling iron metabolism in the seed and young seedling. Through this action air ions apparently divert more endogenous free-state iron to residual iron

(consisting of cytochromes and Fe-containing enzymes) than to active iron. Tracer experiments showed that air ions enhanced the uptake of exogenous iron by early germination barley seeds. The increased incorporation of iron was not influenced by light.##

00577

A. P. Krueger, S. Kotaka, and P. C. Andriese

STUDIES ON AIR-ION-ENHANCED IRON CHLOROSIS. I. ACTIVE AND RESIDUAL IRON. Intern. J. Biometeorol., 8(1):5-16, 1964.

The effects of positive and negative air ions on the active and residual iron fractions of barley seedlings were studied during the course of iron chlorosis. Active iron is that fraction localized in the chloroplasts which dissolves in 1.0 N HCl and participates in the biosynthesis of chlorophyll. Residual iron is not soluble in 1.0 N HCl and is not concerned with the biosynthesis of chlorophyll. Air ions of either charge induced a significant decrease in active iron content which was associated with a decrease in chlorophyll content. Concomitantly there occurred an increase in both the residual iron and the cytochrome c fractions of the seedlings. There is evidence that the rise in residual iron content may involve not only cytochrome c but also other cytochromes and iron-containing enzymes as well. We have theorized that the site of air ion action in the experiments reported may be the regulatory systems controlling iron metabolism in the seed and young seedling. Through this action air ions apparently divert endogenous free-state iron from conversion to active iron and make it available for the production of a number of iron containing compounds which are components of the residual iron fraction. (Authors' abstract)##

00601

S. Kotaka, A.P. Krueger P.C. Andriese

EFFECT OF AIR IONS ON IAA CONTENT OF BARLEY SEEDLINGS. Plant Cell Physiol. (Tokyo) Vol. 6:711-9, 1965.

Exposure of barley seedlings (Hordeum vulgaris) growing in sand and liquid cultures to either negatively- or positively-ionized air results in increased growth in terms of integral elongation, and fresh and dry weight increase. Using large quantities of tissue and a modified method it was found that free and bound IAA contents were not significantly modified by exposure of seedlings to ionized air. It might be supposed that an equilibrium between free and bound IAA was not modified by exposure to air ions. (Author abstract)##

00604

A.P. Krueger, S. Kotaka, P. C. Andriese

THE EFFECT OF AIR CONTAINING O2 MINUS, O2 PLUS, CO2 MINUS, AND CO2 PIUS ON THE GROWTH OF SEEDLINGS OF HORDEUM VULGARIS. Intern. J. Biometeorl. Vol. 8(1):17-25, 1964.

Equipment was devised which permitted the addition of specific gaseous ions to the atmosphere of plastic chambers in which seedlings of HORDEUM VULGARIS were grown in sand culture supplie with chemically defined nutrient solutions. Moderate densities of O2 minus or O2 plus ions (18000/cc) in air containing an added 8% of O2 accelerated the growth rate. A like number of CO2 minus or CO2 plus ions in air containing 8% of CO2 inhibited growth, impeded the production of chlorophyll and devitalized the young seedlings. Evidence is presented that O2 minus and O2 plus stimulate the production of cytochromes and other Fe-containing enzymes through their action on the plant regulatory system responsible for the control of Fe metabolism. The toxic effect of CO2 minus and CO2 plus cannot be explained as yet.##

00654

L. Ordin

EFFECT OF AIR POLLUTANTS ON CELL WALL METABOLISM. Arch. Environ. Health Vol. 10(2):189-194, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Pretreatment of oat coleopile sections with fluoride, ozone, or PAN under conditions which inhibit potential growth 50% or less results in more or less similar inhibitory responses in metabolism of the cell wall. Metabolism of cellulose and of glucan components of the more soluble hemicelluloses is inhibited more than is metabolsim of other cell wall components. (Author summary)##

00655

W.M. Dugger, Jr., J.B. Mudd, J. Koukol

EFFECT OF PAN ON CERTAIN PHOTOSYNTHETIC REACTIONS. Arch. Environ. Health 10(2):195-200, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

The effect of the atmospheric oxidant, peroxyacetyl nitrate (PAN) on photosynthetic phosphorylation, NADP plus reduction, and CO2 fixation by chloroplasts prepared from spinach and bean plants has been studied. When this gaseous oxidant was passed through reaction mixtures in the light, inhibition of the photosynthetic reactions occurred. Inhibition in ATP and NADPH formation and the fixation of C-1402 was

prevented by the addition of ascorbate to the reaction mixture Also NADP plus reduction was maintained by adding either excess photosynthetic pyridine nucleotide reductase (PPNR) or heat inactivated PPNR preparations. Gassing the individual components, chloroplasts or PPNR in the light or dark prior to their use in a complete reaction, did not cause inhibition. (Author summary)##

00696

A. F. W. Cole and M. Katz

SUMMER OZONE CONCENTRATIONS IN SOUTHERN ONTARIO IN RELATION TO PHOTOCHEMICAL ASPECTS AND VEGETATION DAMAGE. J. Air Pollution Control Assoc. Vol. 16(4):201-206, Apr. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-113.)

This paper describes an air pollution investigation at Port Burwell, Ontario to determine the pollutant responsible for fleck damage. The study was part of a cooperative project with groups representing the Canada Department of Agriculture, the Meteorological Branch of the Canada Department of Transport, the Air Pollution Control Branch of the Ontario Department of Health, and Imperial Tobacco Co. of Canada Ltd. In 1960 and 1961 the air pollution phase of the project was undertaken by the Occupational Health Division of the Department of National Health and Welfare.##

00737

J.T. Middleton, L.O. Emik, O.C. Taylor

AIR QUALITY CRITERIA AND STANDARDS FOR AGRICULTURE. J. Air Pollution Contorl Assoc., 18(10):476-480, Oct. 1965. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 19659)

Air pollution damage to crops is not only important for the damage it causes agriculture but because vegetation damage is a harbinger of air pollution problems affecting man and his well-being. Some of the effects of varying dosages of ethylene, fluoride, ozone, PAN, and sulfur oxides on plants and animals are given. Knowledge of the response of certain plants and animals to specific air pollutants permits the establishment of air quality standards for certain of these pollutants. The importance of environmental conditions on host responses to these several toxicants is also presented to illustrate the need of stipulating environmental conditions as well as toxicant dosages when establishing air quality criteria and standards for the protection of the agricultural resource.##

00775

W.W. Heck, J.A. Dunning, I.J. Hindawi

INTERACTIONS OF ENVIRONMENTAL FACTORS ON THE SENSITIVITY OF PLANTS TO AIR POLLUTION. J. Air Pollution Control Assoc., 15(11):511-515, Nov. 1965. (Presented at the 58th Annual Meeting. Air Pollution Control Association, Toronto, Canada June 20-24, 1965.)

Before potential damage to vegetation can be adequately forecast, even after an air pollution alert has been placed in effect, a clear understanding of the interactions of environment on plant sensitivity must be ascertained. This involves detailed study of single factors and then multiple factors using the phytotoxicants in question. Factors studied or suggested included light (quality, intensity, and duration), temperature, carbon dioxide concentration, humidity, wind, soil moisture, soil aeration, nutrient levels, and soil texture. This paper presents a review of the work relating plant injury to specific air pollutants as conditioned by environmental conditions. Preliminary research with ozone is discussed. (Author abstract)##

00786

A.P. Krueger, S. Kotaka, P.C. Andriese

THE EFFECT OF ABNORMALLY LOW CONCENTRATIONS OF AIR IONS ON THE GROWTH OF HORDEUM VULGARIS. Intern. J. Biometeorol., 9(3):201-209, 1965.

A chamber has been designed for growing seedlings in a chemically defined medium while maintaining them in air containing ca 30 plus and 30 minus air ions/cu cm. Air-ion depletion produces a significant reduction in growth of HORDEUM VULGARIS seedlings as measured by integral elongation, fresh weight and dry weight. There is no gross change in chlorophyll production but after 30 days of growth the plants have very soft leaves and lack normal rigidity. (Author abstract)##

00950

W. H. Dugger, Jr., J. Koukol, and R. L. Palmer

PHYSIOLOGICAL AND BIOCHEMICAL EFFECTS OF ATMOSPHERIC OXIDANTS ON PLANTS. J. Air Pollution Control Assoc., 16(9):467-471, Sept. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-47.)

Photochemically produced oxidants in the atmosphere cause injury

to plants primarily through inhibition of basic metabolic processes. Plants vary in their response to the oxidants and this variation must be dependent in part on the variation in metabolic activity with age or environmental conditions for growth, to a large degree not understood. Data are presented in this paper to show: (1) The changes in permeability of leaf tissue to exogenous substrate and in catabolic utilization of this substrate after exposure of plants to ozone but before visible symptoms appear; (2) The change in leaf carbohydrates as a result of exposure to ozone; (3) The protective effect of red light (700 millimicrons) during exposure of bean plants to peroxyacetyl nitrate (PAN); (4) The correlation of sulfhydryl (SH) content in bean leaf tissue with age of plants and light regime; and (5) Effect of light regime and age of plants on incorporation of C14 from C14-Pan by bean leaf tissue. (Author abstract)##

00953

H. E. Heggestad

OZONE AS A TOBACCO TOXICANT. J. Air Pollution Control Assoc., 16(12):691-694, Dec. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966.)

Tobacco leaves may develop many types of pathogenic and nonpathogenic leaf spots, but not until 1958 was it known that the air pollutant ozone was the primary cause of a leaf spot on tobacco known as weather fleck or ozone fleck. Cigar-wrapper tobacco which is grown under cotton cloth for shading is very sensitive to ozone. This report presents most of the available information on ozone as a tobacco toxicant.##

00961

I. J. Hindawi and A. P. Altshuller

PLANT DAMAGE CAUSED BY IRRADIATION OF ALDEHYDES. Science 146(3643):540-542, Oct. 23, 1964.

The report that damage to petunia has been correlated with the presence of aldehydes in the atmosphere is discussed in relation to recent laboratory findings. Laboratory investigations have shown that irradiation of formaldehyde in air will not cause plant damage to the varieties of petunia, pinto bean, and tobacco wrapper used, even when nitrogen oxide is added to the system. Irradiation of propionaldehyde in air does cause damage to these plants. Addition of nitrogen oxide to the irradiated propionaldehyde-in-air system does not markedly increase damage. (Author abstract)##

00963

Taylor, O. C., and F. M. Eaton

SUPPRESSION OF PLANT GROWTH BY NITROGEN DIOXIDE. Plant Physiol. Vol. 41:132-135, 1966. 9 refs.

Nicotiana glutinosa and pinto bean seedlings (Phaseolus vulgaris) were exposed for short periods (3 days or less) to high concentrations of NO2 (4.11-20.53 mg/cubic meter) to compare the resulting leaf lesions with ozone damage produced at concentrations of 0.43 to 0.86 mg/cubic meter. Although the same physiological age leaf tissue was damaged by both toxicants, damage caused by NO2 was unlike that caused by ozone. Pinto bean (Phaseolus vulgaris) and Pearson improved tomato (Lycopersicon esculentum) seedlings were continuously exposed for 10 to 22 days, to low concentrations of NO2 (less than 1.03 mg/cubic meter). These exposures caused significant growth suppression, increase in green color (total chlorophyll content), and distortion of leaves. (Authors' summary) ##

01014

G. H. Hepting

DAMAGE TO FORESTS FROM AIR POLLUTION. J. Forestry 62(9):630-634, Sept. 1964. (Presented at North Carolina State of North Carolina Univ., Raleigh, N.C., Apr. 9, 1964, as one of the University's Inst. of Biological Sciences Lecture Series.)

Until a few years ago damage to forests from air pollution consisted mainly of localized but very severe cases of mortality and growth loss due to oxides of sulfur or to fluoride associated with ore reduction, with a minor contribution from other sources. In recent years oxidant damage, attributed largely to ozone in Los Angeles smog, is considered partly responsible for destroying ponderosa pine in the mountains east of that city. Oxidant has also been determined as the cause of a long-known needle blight of eastern white pine now called emergence tipburn, and evidence is accumulating that the eastern white pine disease long known as chlorotic dwarf may be due to an abiotic air-borne agent. Mortality and growth loss of this species has also been occurring within a 20-mile radius of certain power plants consuming large quantities of soft coal. When potted ramets (vegetative reproductions) of selected sensitive white pine clones were exposed in an area embracing an industrial complex in east Tennessee, exposure for seven months resulted in uniformly severe damage. Ramets from resistant trees, similarly exposed, suffered no damage. Sensitive ramets kept out of the affected area remained healthy. New and important types of crop damage, including damage to trees, appear to be resulting from air pollution associated with our enormous urban development, with stack gases from new industrial processes, and with greatly increased emissions of stack gases from industrial plants using fossil fuels at rates far beyond consumtpion only 15 years ago. (Author abstract) ##

01250

M. Threshow

EVALUATION OF VEGETATION INJURY AS AN AIR POLLUTION CRITERION.
J. Air Pollution Control Assoc. 15, (6) 266-9, June 1965.

Foliar markings on vegetation have proven a highly sensitive criterion for the presence of many air pollutants; proper evaluation of such effects can serve as a valuable and inexpensive tool for delineating an air pollution condition. Injury symptoms from fluoride, sulfur dioxide, photochemical oxidants and other pollutants have been described and can be recognized by experienced observers. Several factors must be considered in appraising injury. These include a knowledge of the relative sensitivity of plant species to various pollutants, the syndrome of injury on a number of plants and species, and distribution and geographic relation of affected plants to the suspected source. Background information on cultural, environmental, disease and insect conditions which might be responsible for, or modify, foliar markings or chronic effects in question must also be understood. For some pollutants a chemical analysis of foliage and air may prove helpful. When these factors are studied, the presence, distribution and magnitude of an air pollution situation can be evaluated, thus providing a sensitive criterion of air quality. (Author abstract modified) ##

01391

F.W. Went

DISPERSION AND DISPOSAL OF ORGANIC MATERIALS IN THE ATMOSPHERE.
Nevada Univ., Reno, Desert Research Inst., 10p., April 1966.
(Series No. 31.) Also: Intern. J. Biometeorol.
(Amsterdam), Vol. 11, 1967.

Author reiterates the sensitivity that plants have to smog and shows that plants are used as an indicator of air pollution. Also discussed, in general terms, are the roles that meteorological conditions (in particular, haze) play in the health impairment of individuals. Author concludes by stating there is a need for additional study of the mechanisms in which volatile organic substances may be involved in problems of human health. ##

01398

G.H. Hepting

AIR POLLUTION IMPACTS TO SOME IMPORTANT SPECIES OF PINE.
J. Air Pollution Control Assoc., 16(2):63-65, Feb. 1966.

In the past, many species of pine have been severely damaged by acute forms of air pollution associated with ore smelting. More recently, damage to ponderosa pine in the State of Washington has been associated with atmospheric fluoride, and this species in particular has also suffered smog damage in southern California. In the East, whie pine has been declining in the vicinity of

certain soft-coal-burning power plants, and in one case downwind from an oil-burning power plant; also, throughout the East, an atmospheric oxidant of unknown source has caused a type of needle blight on white pine. Trash burners and city dump combustion have led to the killing of certain pine species, leaving other intermixed pine species unharmed. Localized damage to white pine from automobile exhaust has been observed. Differences in the susceptibility of neighboring trees of the same species to a given air pollutant have been observed repeatedly. (Author abstract) ##

01421

H. A. Menser and H. E. Heggestad

OZONE AND SULFUR DIOXIDE SYNERGISM: INJURY TO TOBACCO PLANTS. Science, Vol. 153: 424-425, July 22, 1966.

Tobacco plants displayed ozone-type injury when exposed to mixtures of ozone and sulfur dioxide at subthreshold concentrations. The syndrome suggests synergism between ozone and sulfur dioxide that lowers thresholds to injury; exposure to the individual gases at the mixed-gas concentrations caused no symptoms. (Author abstract) ##

01449

A. P. Krueger, S. Kotaka, and P. C. Andriese

A STUDY OF THE MECHANISM OF AIR-ION-INDUCED GROWTH STIMULATION IN HORDEUM VULGARIS. Intern. J. Biometeorol., 7(1):17-25, 1963.

Hordeum vulgaris seedlings grown in a chemically defined Fe-free nutrient solution develop iron chlorosis. When the growth takes place in unipolar ionized atmospheres of either charge the onset of chlorosis is accelerated and this is accompanied by the appearance of large amounts of cytochrome c. Apparently the air ions cause most of the limited store of Fe present in the seeds to be utilized preferentially in the synthesis of cytochrome c and not enough is available to support the normal biosynthesis of chlorophyll. When the seedlings are grown in a substrate containing Fe and are exposed to ionized air they do not develop chlorosis but exhibit the typical ion-induced increase in growth rate and an increased production of cytochrome c. Here the supply of Fe is sufficient to provide for both the biosynthetic processes. No evidence was found that a change in ratio of free to bound indole-3-acetic acid accompanies the ion-induced stimulation of growth. (Author abstract) ##

01666

I.A. Leone, E. Brennan, R.H. Daines

WHAT IS IN NEW JERSEY AIR THAT CAUSES PLANT DAMAGE? New Jersey Agr. 44, 11-3, Aug. 1962

Air samples were taken in Carlstadt, Bordentown and at New Brunswick, and SO2,O3 and NC2 were determined daily during a 4-hr period. With regard to SO2, Carlstadt was the most polluted, New Brunswick next, and Bordentown had the lowest pollution. In Carlstadt and New Brunswick SO2 often exceeded 0.1 ppm which is believed to cause damage to alfalfa, violets and crab apple. In all three locations O3 frequently exceed the 0.035 ppm which causes fleck on tobacco and other more sensitive plants. NO2 is a constituent of some of the photochemical reactions which produce material toxic to plants. High barometric pressure and low wind speed are associated with an increased air pollution load.##

01697

S. Kotaka, A.P. Krueger, P.C. Andriese, K. Nishizawa, T. Ohuchi, M. Takenobu, Y Kozure

AIR ION EFFECTS ON THE OXYGEN CONSUMPTION OF BARLEY SEEDLINGS. Nature 208, (5015) 1112-3, Dec. 11, 1965.

Barley seeds (Hordeum vulgaris var. "Musashino") were soaked in distilled water and aerated for 3-5 days. Germinated seeds with several roots 1-2 cm long, but without an emerging coleoptile, were placed on "Cashmiron" wool moistened with distilled water in a plastic Petri dish. Each of three dishes containing 30 seeds was placed in a plastic ion chamber. The seeds were exposed in the dark to air-ion densities of 4.5 times 10 to the 7th power (-) ions/sq cm/ sec; 4.0 times 10 to the 7th power (plus) ions /sq cm/ sec or to normal non-ionized air. At stated intervals 5 seedlings were collected from each chamber and their oxygen consumption was measured by conventional manometric methods at 30 C repeating each determination three times. Next, the seedlings were dried, first in an oven at 60 C, then over calcium chloride in a desiccator, and they were weighed. Even as early as 24 hr. after the start of exposure to air ions, there was a clear-cut increase in oxygen consumption of the treated seedlings as compared with the controls and the percentage increase at each time-interval remained relatively constant throughout the 96-hr. period of observation. Evidently an increased oxygen consumption is a significant element in the response of higher plants to treatment with air ions.##

01728

I. Ordin and A. Altman

INHIBITION OF PHOSPHOGLUCOMUTASE ACTIVITY IN OAT COLEOPTILES BY AIR POLLUTANTS. Physiol. Plantarum 18, 790-7, 1965.

A marked inhibition of cellulose and of glucan biosynthesis

induced by the air pollutants fluoride, ozone and peroxyacetyl nitrate (PAN) was found in oat coleoptile sections. It was suggested that a common point of attack by these inhibitors might be phosphoglucomutase which catalyzes the interconversion of glucose-6-phosphate and glucose-1-phosphate. Glucose-1-phosphate is a probable precursor for glucan and cellulose biosynthesis. Fluoride is known to inhibit plant phosphoglucomutase in vitro more than the other enzymes involved in sucrose biosynthesis. Photooxidation producing inactivation has been carried out with pure phosphoglucomutase of animal origin. The influence of the air pollutant oxidants both in vivo and in vitro on this enzyme is unknown. The purpose of this report is to present results concerning the effect of these inhibitors on phosphoglucomutase activity in oat coleoptile tissue and the effects on enzyme prepared from this tissue.##

C1800

R.H. Daines, I.A. Leone, E. Brennan

AIR POLLUTION AS IT AFFECTS AGRICULTURE IN NEW JERSEY. Rutgers - The The State Univ., New Brunswick, N.J., Agricultural Experiment Station. (Bulletin 794).

Plant damage in New Jersey from sulfur dioxide, hydrogen fluoride, herbicides, ozone, and from oxidants other than ozone is discussed. Relevant literature is reviewed.##

01809

J.T. Middleton

TRENDS IN AIR POLLUTION DAMAGE. Arch. Environ. Health 8, 19-23, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

Plant damage from particulates, oxidants, ozone, ethylene, fluoride and sulfur dioxide are discussed. The trends in California are emphasized. The relevant literature is reviewed.##

C1904

L. H. Stolzy, O. C. Taylor, W. M. Dugger, Jr., and J. D. Mersereau.

PHYSIOLOGICAL CHANGES IN AND OZONE SUSCEPTIBILITY OF THE TOMATO PLANT AFTER SHORT PERIODS OF INADEQUATE OXYGEN DIFFUSION TO THE

ROOTS. Soil Sci. Soc. Am. Proc. 28, (3) 305-8, June 1964.

The degree to which tomato leaves were altered following short periods of reduced oxygen in the root zone was studied in relation to the following factors: apparent rate of photosynthesis, susceptibility to ozone, and carbohydrates concentration. Reduced rates of soil oxygen for 8 1/2 hours brought about a 50% decrease in CO2 fixation by plants, while shorter periods (3 hours) had only a slight effect on apparent photosynthesis. However, the short period of anaerobic treatment over the soil surface, followed by normal soil aeration for 24 hours, reduced the susceptibility of the plant to ozone damage by as much as 50%. Carbohydrate analysis of leaf tissue for similarly treated plants showed a 50% reduction in sucrose and 33% reduction in starch. It is hypothesized that the anaerobic pretreatment brought about a change in the root membrane permeability or a shift in metabolism that promoted excretion of certain carbohydrates from the roots which in turn changed the concentration of carbohydrates in the leaves. (Author abstract) ##

01905

W. W. Thomson, W. M. Dugger, Jr., and R. L. Palmer.

EFFECTS OF PEROXYACETYL NITRATE ON ULTRASTRUCTURE OF CHLOROPLASTS. Boton. Gas. 126 (1) 66-72, 1965.

Electron-microscope studies of leaves fumigated and subsequently damaged by peroxyacetyl nitrate revealed that the chloroplasts were markedly altered as the damage developed. The first noticeable change was the appearance of small electron-dense granules in the stroma. The granules increased in number until the stroma was almost completely electron dense. Subsequently, "crystalline" arrays of granules appeared, and the chloroplasts became altered in shape. The granules seemed to fuse into rods and then into an organized system of plates. Finally, the integrity of the cellular membranes was disrupted, and the cell contents clumped together in a large mass. The organized system of plates was still present in this mass and even seemed to continue developing. (Author abstract) ##

02209

W.M. Dugger, Jr., O.C. Taylor, E. Cardiff, C.R. Thompson

STOMATAL ACTION IN PLANTS AS RELATED TO DAMAGE FROM PHOTOCHEMICAL OXIDANTS. Plant Physiol., 37, 487-91, 1962.

The role of stomates, as a factor in controlling the injury to

plants from the photochemically produced pollutants, ozone and peroxyacetyl nitrate (PAN), was investigated. Stomatal action was quantitatively measured by determing the resistance of air flow through the stomates with a Wheatstone bridge resistance porometer. By a combination of measurements involving apparent photosynthesis, transpiration, and degree of leaf damage produced by the air pollutant oxidants it was shown that: (A), Stomates open rapidly in the light, even after a long dark period, and close slowly in the dark; (B), Transpiration rate from plants transferred from the dark to the light equals the rate of control plants in the light within 30 minutes; (C , The physiological age of bean plants and not the degree of stomatal opening determines the susceptibility to the two oxidants. Five and six day old bean plants are not damaged by ozone yet the stomates are functional. Plants of this age are most susceptible to PAN damage; (D), Apparent photosynthesis and degree of stomatal opening are not significantly reduced in pinto bean by a 30 minute fumigation with ozone. The length of the pre-fumigation dark period determines the extent of leaf damage from this pollutant. The nature of ozone damage and the protective action of a long pre-fumigation dark period suggest that the level of carbonhydrates in the leaves has some role in predisposing plants to damage from this oxidant. (Autho: summary)##

02299

J.T. Middleton

PLANT DAMAGE: AN INDICATOR OF THE PRESENCE AND DISTRIBUTION OF AIR POLLUTION. Bull. World Health Organ. (Geneva) 34, (3) 477-80, 1966.

Air pollutants may damage plants and cause death or destruction of tissue with visible pathological symptoms, reduce growth, productivity, and commodity quality, and interfere with biological processes without causing visible injury symptoms. The contaminants responsible for damage may be either particulate or gaseous in nature. The solid particles released into the atmosphere are sometimes the cause of soiling of fruits and vegetables, tissue damage to exposed leaves and fruits, growth reduction; in addition, they add a toxic burden to forage crops used as feedstuffs for livestock. Liquid particles, such as acid aerosols and toxic mists, are sometimes responsible for leaf spotting. The greatest amount of damage to animals and vegetation is usually caused by gaseous air contaminants, which directly injure plants and indirectly injure animals by the toxic effects produced after the animal has consumed contaminated forage and food supplements. This discussion of plant damage symptoms and responses has been directed to the qualitative aspects necessary for assessing the presence and distribution of pollution. As to the evaluation of the concentration and duration of exposure to specific pollutants, experimental systems are available, or can be designed, to meet these specific quantitative needs once the presence of given pollutants has been determined.##

02313

S. H. Linzon

DAMAGE TO EASTERN WHITE PINE BY SULFUR DIOXIDE, SEMIMATURE-TISSUE NEEDLE BLIGHT, AND OZONE. J. Air Pollution Control Assoc. 16, (3) 140-4, Mar. 1966.

Eastern white pine (Pinus strobus L.) forests were severely damaged by atmospheric sulfur dioxide up to distances of 25 miles northeast of large smelters located in the Sudbury mining district of Ontario. Damage to white pine was measured in terms of foliage, bark, and biological injuries, radial and volume growth decrement, and tree mortality. The foliar symptoms of sulfur dioxide injury on white pine trees sometimes resemble those caused by a physiogenic disease, semimature-tissue needle blight (abbreviated to SNB). Studies on the nature and etiology of SNB were conducted in white pine forests in the Upper Ottawa Valley, which are remote from smelter operations which might pollute the atmosphere. These studies included the determination of the role that naturally-occurring atmospheric ozone plays in the occurrence of SNB. Differences between the symptoms of sulfur dioxide injury, SNB, and ozone damage are outlined. (Author abstract)##

02371

EFFECTS OF AIR POLLUTANTS ON ORGANISMS OTHER THAN MAN (FOR PSAC SUB-PANEL ON ENVIRONMENT POLLUTION). Preprint. Public Health Service, Washington, D.C., Div. of Air Pollution 1965.

This paper reviews damage to vegetation by exhaust components, industrial effluents and photochemistry. Author cites evidence of damage to animals, under natural conditions, gained from observation of cattle affected by fluorides. Agricultural economic losses, as well as current and proposed research are discussed.##

02379

C. B. Thompson.

THE TOTAL EFFECT OF AIR POLLUTANTS ON BEARING CITRUS. Preprint. 1965.

The three field installations of plastic covered greenhouse established over bearing lemon and orange trees will be continued for one, two and three years, respectively, until five years of data are obtained at each installation on the effects of air

pollutants on fruit yield, leaf drop, fruit quality and storage stability of fruit. More refined measurements of the more basic responses of the trees, apparent photosynthesis, respiration and transpiration will be made and correlated with the occurrence of specific pollutants in the air. The way in which oxidants cause increased leaf drop will be studied. The effects of very low levels of fluoride on trees will be investigated to find out whether or not there may be a significant stimulation of the above mentioned responses, especially fruit yield. The effect of nitrogen dioxide will be examined in the fractions of one part per million range. Interrelationships between the presence of air pollutants and beneficial or deleterious insects will be examined. An attempt will be made to determine threshold levels of pollutants below which no injury occurs to plants. A concerted effort will be made to overcome the excessive fruit abortion of navel oranges by the application of antioxidants. Results of some of the studies in the following categories are reported: photosynthesis; fruit yield, transpiration; leaf carbohydrate levels; anthrone reducing carbohydrates in citrus leaves; leaf drop. (Author summary modified)##

02537

G. Seidman

EFFECTS OF AIR POLLUTION ON PLANTS. African Violet Mag. 18, (3) 44-7, Mar. 1965

The first indication of an air pollution problem is often the injury that appears on comparatively sensitive vegetation. Some plants are more resistant than others to a given phytotoxicant. Plant injury from air pollution is caused primarily by the major gaseous pollutants (sulfur dioxide, fluoride gases, ethylene, and the components of the photochemical smog complex) and is produced in various ways in urban or industrial areas. These major pollutants and several of the minor pollutants are discussed in this paper.##

C2744

H. E. Heggestad

EFFECTS OF OZONE ON TOBACCO. Preprint. (Presented at Staff Meeting, Division of Air Pollution, Public Health Service, Washington, D.C., Dec. 3, 1964.)

Ozone has been established as the cause of tobacco weather fleck. Connecticut shade-grown cigar-wrapper varieties were used in these studies because fleck was first recognized as an economic problem on wrapper tobacco. Evidence was obtained to indicate that the pollution source at Beltsville, Maryland, was metropolitan Washington, D.C. When used as pre-fumigation

cultural practices, warm temperatures and dark periods increased ozone sensitivity, and cool temperatures and extended photoperiods reduced ozone sensitivity. Ascorbic acid levels, higher in plants that received extended photoperiods, suggested that greater sensitivity, as well as varieties with more ozone resistance, were developed. The lowest ozone concentration required for conspicuous injury to the most sensitive tobacco, Bel W-3, was a 2-hour exposure at 5.3 to 6.6 pphm (Mast instrument), or 8 to 10 pphm (KI method). Tobacco plants grown in carbon-filtered air surpassed controls grown in ambient air, even with a resistant variety which remained free of conspicuous leaf injury. (Author summary) ##

C2916

W. M. Dugger, Jr., O. C. Taylor, C. R. Thompson, and E. Cardiff

THE EFFECT OF LIGHT ON PREDISPOSING PLANTS TO OZONE AND PAN DAMAGE. J. Air Pollution Control Assoc. 13, (9) 423-8, Sept. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-87.)

The variations observed in the field were also observed in greenhouse studies where growing conditions were more easily controlled. The difference in response of various age bean plants suggested that the mechanism of ozone damage is different from PAN damage. Peroxyacyl compounds caused an under-surface glazing of the leaf whereas ozone caused a general necrotic stippling of the upper surface. The retention of damage potential to ozone was maintained in older plants for several days longer than the potential for PAN damage. The rapid gain and loss of damage potential as plants developed with the very small change in degree of stomatal opening indicated that some other factor was more important in controlling plant susceptibility to smog than stomates. Stomates obviously need to open for atmospheric oxidants to enter the plants and initiate damage. Light and dark studies and effect of a long dark period on ozone damage are discussed.##

03092

I.A. Leone, E. Brennan, R.H. Daines

EFFECT OF NITROGEN NUTRITION ON THE RESPONSE OF TOBACCO TO OZONE IN THE ATMOSPHERE. J. Air Pollution Control Assoc. 16, (4) 191-6, Apr. 1966

Experiments were conducted to determine the effect of nitrogen nutrition on the response of tobacco to ozone in the atmosphere. With Nicotiana rustica L., a noncommercial tobacco,

plants receiving an "optimum" nitrogen supply were found to be more susceptible to ozone injury than those receiving deficient or luxury supplies. Furthermore, it was found on analyses of the third oldest tobacco leaf that, while these "optimum" plants showed little or no increase in respiration as a result of ozone in concentrations too low to produce visible injury, plants grown with deficient or excess nitrogen showed a significant increase in respiration under these conditions. The increase in respiration was accompanied by a comparable and equally significant decrease in carbohydrate content in the latter plants which was not apparent in plants at the "optimum" nitrogen supply, as well as an increase in total nitrogen, protein-nitrogen, and amino-acid nitrogen. In conclusion, it is suggested that the carbohydrate reserve built up in plants grown with deficient nitrogen nutrition serves as protection against the oxidative potential of ozone. Likewise, a decrease in carbohydrate content below that of "optimum" plants provides protection in plants grown with an overabundance of nitrogen fertilization, through possibly by a more complex mechanism. (Author abstract) ##

03094

O.C. Taylor, E.A. Cardiff, J.D. Mersereau

APPARENT PHOTOSYNTHESIS AS A MEASURE OF AIR POLLUTION DAMAGE. J. Air Pollution Control Assoc. 15, (4) 171-3, Apr. 1965 (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif. Jan. 6-7, 1964.)

A system has been developed to automatically measure the effects of air pollutants in the ambient air on the rate of CO_2 exchange by intact leaves of citrus trees growing in the field. A miniaturized system utilizing the same nondispersive infrared CO_2 analyzer has been designed to study individually the effects of different concentrations of air pollutants on photosynthesis and respiration by plants. (Author abstract) ##

03098

B.L. Richards O.C. Taylor

SIGNIFICANCE OF ATMOSPHERIC OZONE AS A PHYTOTOXICANT. J. Air Pollution Control Assoc. 15, (5) 191-3, May 1965

Since the recognition of ozone as a major phytotoxicant in crop plants in 19578 ozone type symptoms have been observed in a wide range of vegetation. These observations include leafy vegetables, field, forage, and textile crops, also shrubs, broad-leafed ornamental, fruit and forest trees, and various conifers.

Fumigation experiments at various institutions have confirmed the etiological relation of ozone in many of these observations. Such visible injuries fail to provide a reliable index to the damaging impact of ozone on the numerous plants affected. Hidden injury or damage by ozone at sub-necrotic levels has been reported and experimentally established in a number of crop plants. Evidence is available which indicates that citrus varieties are so affected, and that much of the citrus decline in Southern California may be ozone induced. Photochemically induced ozone may prove to be the most persistent, if not the most difficult, of atmospheric phytotoxicants to control. Ozone type injury has been reported from eighteen different states, and from Canada to Japan. (Author abstract)##

03163

I. I. Impens, D. W. Stewart, L. H. Allen, Jr., and E. R. Lemon

DIFFUSIVE RESISTANCES AT, AND TRANSPIRATION RATES FROM LEAVES IN SITU WITHIN THE VEGETATIVE CANOPY OF A CORN CROP. Dept. of Agriculture, Ithaca, N.Y., Plant, Soil and Nutrition Lab. (Interim Rept. 66-1) (Task IVO-14501-B53A-08). June 1966. 26 PP.
CFSTI,DDC AD 638 348

At several heights and times of day within a crop of Zea mays, internal leaf diffusion resistance and external boundary layer diffusion resistance were evaluated by measuring the temperature of a transpiring and a nontranspiring leaf (simulated by covering both sides of a normal leaf with strips of polyethylene tape), and by measuring the immediate air temperature, humidity and windspeed. Both external boundary layer diffusion resistance and internal leaf diffusion resistance increased with depth into the crop. However, external boundary layer diffusion resistance generally was less than 10% of internal leaf diffusion resistance. Profiles of latent-heat flux density and source intensity of transpiration showed that transpiration corresponded roughly to foliage distribution (with an upward shift) and were not similar to the profile of radiation absorption. The data were compared with heat budget data. The two approaches yielded quite similar height distributions of transpiration per unit leaf area and total transpiration resistance. The total crop resistance to transpiration was computed as 0.027 min/cm. This compares well with Monteith's values of 0.017 to 0.040 min/cm for beans (Phaseolus vulgaris L.) (17), and Linacre's values of 0.015 to 0.020 min/cm for turf. (Author abstract)##

03292

F. R. Burleson, E. R. Stephens, and E. A. Cardiff.

THE PRODUCTION OF PURE PEROXYACYL NITRATES. Preprint.

(Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

Some naturally occurring photochemical products of "smog" were first identified as "compound X" by Stephens et al in 1956. In 1960, the first member of the series was recognized as peroxyacetyl nitrate (PAN) by Stephens et al. The C3 homologue, peroxypropionyl nitrate (PPN) was reported in synthetic mixtures by Stephens in 1961. Both the C2 and C3 homologues were detected in ambient air by Darley et al in 1963. only from synthetic preparations. The first 3 organic N compounds have been synthesized and purified at the Air Pollution Research Center, University of California, Riverside, for the past several years. Plant fumigations have demonstrated that these compounds are capable of inducing injury symptoms indistinguishable from those caused by photochemical smog. They are also powerful eye irritants. They have been identified (as a class) in artificially irradiated dilute auto exhaust, and in artificially irradiated mixtures of realistic concentrations of pure hydrocarbon plus oxides of nitrogen. The three purified synthetics have been used in plant fumigation tudies, in eye irritation studies, in physical and chemical studies designed to confirm the structure of the compounds, and in instrument design and calibration. The principal problem in this preparation is the extreme instability of these compounds.##

03395

M.D. Thomas

EFFECTS OF AIR POLLUTION ON PLANTS. World Health Organ. Monograph Ser. 46 (Air Pollution), 1961. pp. 233-78.

The literature on the effects of air pollution on plants has been reviewed with special reference to those pollutants that present major problems - viz., SO2, HF, London type smog, and Los Angeles type smog. The others, which are definitely of minor importance, are referred to more briefly. SO2 has long been recognized as an air pollutant because it arises from the combustion of nearly all fuels, especially coal, and from the roasting of sulfide ores. It is phytotoxic in concentrations above 0.1 x 0.2 p.p.m., depending on the length of exposure. Below about 0.4 p.p.m., the gas tends to be oxidized in the cells as rapidly as it is absorbed, and interference with functions such as photosynthesis is slight. Toxic concentrations of sulfate are finally accumulated. Chronic rather than acute injury, if any, is generally manifested with these small concentrations. Above about 0.4 p.p.m., acute injury occurs more frequently, owing to the reducing properties of sulfate in the cells. Temporary interference with photosynthesis or "invisible injury" can occur to some extent, but these concentrations cause acute injury if maintained for more than short periods, and recovery is rapid when the fumigation is stopped. HF behaves somewhat similarly to SO2, except that with a few species of plants it is effective in causing lesions and

interfering with photosynthesis in concentrations 2 or 3 orders of magnitude smaller than in the case of SO2. With most species it is up to 10 times as effective as SO2. Fluoride accumulated in the cells in sublethal amounts interferes with photosynthesis as does sulfite, but whereas the latter is deactivated by simple oxidation to sulfate, the former must be removed by translocation, volatilization, or some obscure chemical reaction, which makes much slower the recovery of the plant functions after HF fumigation. There appears to be a concentration of HF for each species below which "invisible injury" does not occur. The Los Angeles type smog is fairly well understood as to its mode of formation and its phytotoxic effects, but the actual compounds that cause these effects are still unknown. The smog causes characteristic leaf lesions which are quite different from those produced by other pollutants, including ozone, which may be a constituent of the smog. It also causes some "invisible" injury. Visible damage to crops in Southern and Northern California was estimated at over $5 000 000 and $1 100 000 respectively, annually, in 1956. (Author summary modified)##

C3472

C. S. Brandt

AIR POLLUTION EFFECTS ON VEGETATION. Conn. Med. 27, (8) 484-6, Aug. 1963.

The effects of air pollution particularly of sulfur dioxide, fluorides and photochemical smog on plants are briefly reviewed. The characteristic symptoms of air pollution injury to plants can be useful tool in field surveys. Great care must be exercised in using plants as indicators of air pollution, because many factors affect the symptoms, development, and interpretation of plant indicators.##

03495

L. Ordin and B. P. Skoe

OZONE EFFECTS ON CELL WALL METABOLISM OF AVENA COLEOPTILE SECTIONS. Plant. Physiol. 39, (5) 751-5, Sept. 1964. (Part of this work was reported at the Annual Meeting, American Society of Plant Physiologists, Amherst, Mass., Aug. 28, 1963.)

Pretreatment of coleoptile tissue with 90 to 140 ppm by volume of ozone resulted in a subsequent stimulation of glucose uptake without destroying the final growth capacity of the tissue. This phenomenon occurred at both 0.00001 M and 0.05 M external glucose concentration. Cellulose synthesis and incorporation of C-14 from C-14 labeled glucose into glucan components of the cell wall were most readily inhibited by ozone treatment. Metabolism of other cell wall components was affected much less under conditions

resulting in less than 50% inhibition of potential growth. The relationship of ozone to other inhibitors of cell wall metabolism and growth was discussed. It was suggested that ozone inhibition of glucan and cellulose metabolism may be a factor in inhibition of plant growth by ozone. (Author summary)##

03496

L. Ordin, M. J. Garber, B. P. Skoe, and G. Rolle

ROLE OF AUXIN IN GROWTH OF INHIBITOR-TREATED OAT COLEOPTILE TISSUE. Physiol. Plantarum 19, 937-45, 1966.

The role of auxin in the recovery of plant tissue from oxidant treatment was investigated. Treatment of oat coleoptile sections with concentrations of indoleacetic acid (IAA) or 2,4-dichlorophenoxyacetic acid (2,4-D) optimal for normal growth, following pretreatment with moderately inhibiting levels of peroxyacetyl nitrate (PAN) immediately accelerated recovery of growth rate. In some cases inhibition was also less at supraoptimal values of auxin. Treatment of ozone-pretreated tissue with IAA or 2,4-D enhanced inhibition at high levels of auxin and produced an optimal growth concentration level which was lower than for sections not given ozone pretreatment. Auxin treatment also reduced the degree of inhibition in fluoride and iodoacetamide-pretreated sections. Mechanisms by which auxin-induced recovery from inhibition may occur are discussed. (Author abstract)##

03531

C. R. Berry L. A. Ripperton

OZONE, A POSSIBLE CAUSE OF WHITE PINE EMERGENCE TIPBURN. Phytopathology 53, (5) 552-7, May 1963.

Attacks of white pine emergence tipburn occurred in Pocahontas County, W. Va., in summer, 1961, during a period of high atmospheric oxidant concentration. Oxidant concentrations as high as 6.5 pphm were recorded. Potted susceptible white pine ramets were protected from emergence tip-burn by placing them in a chamber supplied with air filtered through activated carbon. Typical disease symptoms were produced on ramets in the greenhouse, using artificially produced oxidant at concentrations and exposure times similar to those recorded in the field, thus strengthening the thesis that an oxidant, probably ozone, is a cause of emergence tipburn. (Author summary)##

03549

D. F. Adams

AN AIR POLLUTION PHYTOTRON (A CONTROLLED ENVIRONMENT FACILITY FOR STUDIES INTO THE EFFECTS OF AIR POLLUTANTS ON VEGETATION). J. Air Pollution control Assoc. 11, (10) 470-6, Oct. 1961. (Presentrd at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The facilities described have been used in the study of the influence of atmospheric fluoride pollution on plant response. The design concepts and resultant equipment are equally applicable to similar plant studies using other atmospheric pollutants. Only relatively minor changes in the atmosphere-producing equipment would be required. So-called field conditions cannot be produced in a phytotron chamber since the objective is one of a completely controlled plant environment. However, numerous parameters such as (a) stem elongation and diameter, (b) leaf size and development, (c) chlorophyll, sugar, carbohydrate, and enzyme content, and (d) respiration and photosynthetic rates, etc., readily respond to all phases of the plant environment and thus introduce difficulties in separating the response to these variables from that of the air pollutant. Thus the availability of such an air pollution phytotron promises to eliminate much of the present uncertainty involved in relating physiological and biochemical measurements with air pollution.##

03573

W. M. Arnold.

THE LONGEVITY OF THE PHYTOTOXICANT PRODUCED FROM GASEOUS OZONE-OLEFIN REACTIONS. Intern. J. Air Water Pollution 2, 167-74, 1959.

Gaseous mixtures of an olefin and ozone were blown at constant rate through a 32 ft. tube of uniform cross section. A small aquatic plant was placed at prescribed intervals within the tube. The phytotoxicants produced from the ozonization of both 3-heptene and 2-pentene were shown to be unstable. The distribution of plant damage within the exposure tube indicated the longevity of the phytotoxicant. The reduction in chlorophyll content of fumigated plants was used as a quantitative measure of damage. The results suggest that the decay of the phytotoxicant follows a first order or pseudo-first order reaction. The half-life of the phytotoxicant from ozonated 3-heptene is 1/4 hr while the phytotoxicant from ozonated 2-pentene has a much shorter half-life. This difference in stability can be explained in terms of the "zwitterion" mechanism. (Author abstract)##

03585

P. G. Brennan, I. A. Leone, and H. H. Daines

ATMOSPHERIC ALDEHYDES RELATED TO PETUNIA LEAF DAMAGE. Science 143, (3608) 818-20, Feb. 21, 1964.

Snowstorm petunias grown in the greenhouse developed a necrotic banding of the actively expanding foliage characteristic of injury ascribed to various photochemically produced pollutants in the atmosphere. In this case the damage appeared to be related to the high aldehyde content of the ambient air. Each time the aldehyde concentration exceeded 0.20 parts per million for 2 hours, injury appeared within a day or two. From July to September 1963 such plant injury was observed on seven occasions. (Author abstract) ##

03595

E. F. Darley, E. R. Stephens, J. T. Middleton, and P. L. Hanst

OXIDANT PLANT DAMAGE FROM OZONE-OLEFIN REACTIONS. Intern. J. Air Water Pollution 1, 155-62, 1959 and Proc. Am. Petrol. Inst., Sect. III 38, 313-22, 1958. (Presented at the 23rd Midyear Meeting, American Petroleum Inst. Division of Refining, Los Angeles, Calif, May 15, 1958.)

The reaction of ozone with five-, six-, and seven-carbon olefins is quite rapid even in the gas phase at concentrations of a few p.p.m. These reaction mixtures produce a toxic material which causes damage symptoms on pinto bean plants which are indistinguishable from those attributed to oxidant-type air pollution. Ozonides, formed in small yield by this reaction, are stable materials which do not damage pinto beans in any way even at concentrations higher than those arising in ozone-olefin reaction mixtures or in outdoor air. Evidence was obtained that the toxic material is unstable even at low concentrations in air. Its half-life appears to be no more than a few min. This result suggests that either a transitory ozone-olefin complex or an unstable zwitter ion formed by its decomposition is the actual toxic substance. Attempts to confirm this by adding excess aldehyde or sulfur dioxide to scavenge the toxicant were not successful. (Author abstract) ##

03596

E. F. Darley, W. M. Dugger, J. B. Mudd, L. Ordin, O. C. Taylor, and E. R. Stephens

PLANT DAMAGE BY POLLUTION DERIVED FROM AUTOMOBILES. Arch. Environ. Health 6, 761-70, June 1963. (Presented at the Fifth Session, Air Pollution Research Conference on "Effects of Motor Vehicle Emissions on Visibility and Vegetation," Los Angeles, Calif., Dec. 6, 1961.)

Emissions from motor vehicles are now known to be the principal source of the raw materials contributing to photochemical air pollution in California. Some of the products of the reaction, ozone, peroxyacyl nitrates, and the unidentified products of ozone-olefin reactions, are very damaging to the leaves of a

variety of crop plants. The injury that was once confined to Los Angeles County now occurs in many states and causes economic loss estimated in excess of $25,000,000 annually. Ethylene, one of the compounds found in the exhaust, is also very injurious to several crops. The ability of a given toxicant to incite injury is dependent on the age of the leaf and the conditions of illumination under which the plant is grown prior to, during, and after fumigation. In addition, the growth of plants, even in the absence of visible injury, is materially affected. Evidence is presented to indicate that the chemical and physical systems within the plant are disrupted by the phytotoxicants. (Author summary)##

03608

J. T. Middleton, J. B. Kendrick, Jr., E. F. Darley

AIR-BORNE OXIDANTS AS PLANT-DAMAGING AGENTS. Proc. Nat. Air Pollution Sym., 3rd, Pasadena, Calif., 1955. pp. 191-8.

The relative susceptibility of some plants to oxidants and determination of the plant-damaging effects of hydrocarbon, ozone, and ozonated olefins are compared. The response of pinto beans to air-borne oxidants occurring in the Los Angeles area are described. The survey data were subjected to further analysis by comparing the percent of plants damaged at five stations with the oxidant mean and maximum ranges observed. Data is presented and show that the mean percent of plants damaged increased with increasing oxidant maximum. Author states that the experiment described is the first of its kind designed to determine the relationship between plant damage and oxidant level in the naturally polluted Los Angeles Basin. The results of the study show that the frequency of damage to plants is associated with the oxidant concentrations for both oxidant maximum and daily oxidant mean.##

03609

J. T. Middleton, J. B. Kendrick, Jr., E. F. Darley

AIR POLLUTION DAMAGE TO AGRICULTURAL CROPS. Lasca Leaves 5(1):6-11, Jan. 1955.

Significant damage of celery, spinach and lettuce was noted in 1945 in the vicinity of Los Angeles. Since these symptoms were different from damage usually associated with recognized pollutants, such as sulfur dioxide, fluoride, chlorine and ammonia, investigations were made which revealed that the toxicants causing this silvering and slight glazing followed sometimes by a bronzed discoloration, are oxidized hydrocarbons. This phenomenon occurred only during periods of reduced visibility due to inversions. Research being conducted at the University of Riverside was concerned

with how agricultural crops can be grown in an area receiving polluted air masses, and to investigate chemical behavior of pollutants using plants as assay method. These laboratory investigations revealed that concentrations of oxidized hydrocarbons as low as 0.1 ppm cause plant damage. These observations corroborated those made in the field showing that damage to crop is directly proportioned to the length of the pollution period. Methods for protection of plants are being studied and briefly discussed in this paper..##

03610

J. T. Middleton, J. B. Kendrick, Jr., E. F. Darley

AIR POLLUTION INJURY TO CROPS. Calif., Agr., 7(11):11-12, 1953.

Economic losses from air pollution injury on plants in Los Angeles County alone exceeded $500,000 since 1949 when losses were estimated to be $479,495. The components identified causing this damage were certain olefinic peroxides, found when ozone reacts with the vapors of unsaturated hydrocarbons derived from gasoline and other petroleum products. Research is in progress to develop methods for the economic production of agricultural crops in areas affected by air pollution.##

C3611

J. T. Middleton

CLEAN AIR FOR GOOD CITRUS. Western Citrus Grower 1(6):6-9, June 1958. (Found in Western Fruit Grower 12, (6), June 1958.)

The adverse effects of polluted air on citrus crops are revieved. Included in the discussion are the effects of sulfur dioxide, ozone, oxidants and fluorides. It is concluded that abatement measures must be taken to protect agricultural areas.##

03612

J. T. Middleton, E. F. Darley, R. F. Brewer

DAMAGE TO VEGETATION FROM POLLUTED ATMOSPHERES. J. Air Pollution Control Assoc. 8, 9-15, May 1958. (Presented at the 22nd Midyear Meeting, American Petroleum Inst. Division of Refining, Philadelphia, Pa., May 14, 1957.)

Damage to vegetation from polluted atmospheres has been recognized for more than a century. Early interest in air pollution centered largely on smoke and fumes from industrial wastes, particularly those of chemical manufacture, smelting, ceramic production, and coal and petroleum combustion effluents. Vegetation damage has increased with industrialization and urban development. Whereas the principal plant toxicants recognized several decades ago were sulfur dioxide and fluorine, in the last decade a new group of airborne phytotoxicants has been described and identified as oxidants. The principal source of these oxidants is believed to be photolysis reaction products of auto exhaust. Atmospheric contaminants responsible for damage to vegetation may be described as particulates - such as dusts and acid aerosols - and gases - such as sulfur dioxide, halogens, oxidized organics, ozone, nitrogen dioxide, hydrogen sulfide, ammonia, and carbon monoxide. Of these diverse pollutants, gases generally cause more damage to plants than do particulates.##

03613

J. T. Middleton A. O. Paulus

THE IDENTIFICATION AND DISTRIBUTION OF AIR POLLUTANTS THROUGH PLANT RESPONSE. A.M.A. Arch. Ind. Health 14, 526-32, Dec. 1956. (Taken from a paper presented at the 17th Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa., Apr. 23-27, 1956.)

This paper presents an annual summary of monthly tabulations showing plant damage occurring in 12 of 51 counties. Regional tabulations show that plant damage is limited to the San Francisco Bay area and the coastal plain of southern California. The areas reporting plant damage are those of greatest population density. The toxicants responsible for plant damage are recognized in decreasing order of importance as oxidized hydrocarbons, ethylene and fluorides. Sulfur dioxide is of unusual occurrence and its distribution usually associated with specific industrial wastes. It is generally believed that ozone is present in the urban areas of Los Angeles and San Francisco and responsible for a significant part of the total atmospheric pollution. The wide-spread distribution of ethylene and smog, or reaction products from the oxidation of hydrocarons, emphasizes the need for regional, research and abatement programs.##

03615

J. T. Middleton

PHOTOCHEMICAL AIR POLLUTION DAMAGE TO PLANTS. Ann. Rev. Plant Physiol., No. 12:431-448, 1961.

The toxic components in photochemical air pollution are typically

the oxidation products of hydrocarbons and result either from the dark reaction of ozone and olefins or the photolytic reaction of nitrogen oxides and hydrocarbons in the presence of sunlight. This paper describes the occurrence and distribution of photochemical air pollution, enumerate some of the raw materials and products of these oxidation systems responsible for plant damage, and indicate the biochemical, physiological, and pathological effects of these contaminants upon plants.##

03616

J. T. Middleton, A. S. Crafts, R. P. Brewer, O. C. Taylor

PLANT DAMAGE BY AIR POLLUTION. Calif. Agr. 9-12, June 1956.

In many of the important growing areas of California the production and quality of vegetables and crops are adversely affected by air-borne toxicants such as ethylene, fluorides, herbicides, oxidized hydrocarbons, ozone and sulfur dioxide. Injury to plants by oxidized hydrocarbons (smog) is distinctly different from crop damage by the other above named precursors. Leaves of celery, lettuce, spinach, and some other vegetables, and of flower crops and African violets usually show silvering and glazing on their lower surfaces, sometimes followed by a bronze or reddish discoloration. Examples of the plant damage are shown in color photographs. Visivle injury to all crops in the Los Angeles areas has caused losses exceeding $3,000,000 annually since 1953. This does not include economic losses from reduced growth and lowered production in the absence of visible injury.##

03617

J. T. Middleton

RESPONSE OF PLANTS TO AIR POLLUTION. J. Air Pollution Control Assoc. 6, (1) 7-9,50, May 1956.

This article compares the relative susceptibility of some plants to oxidants to determine the plant-damaging effects of hydrocarbon, ozone, and ozonated olefins, and to describe the response of the pinto bean to air borne oxidants occurring in the Los Angeles area. Plants vary in their susceptibility to the reaction products from the oxidation of hydrocarbons. The pinto bean has been selected as a test plant for measuring the mechanisms of damage and some of the effects of oxidized hydrocarbons upon the life processes. Controlled fumigations have shown that the severity of plant damage varies with the air temperature. The atmosphere in Los Angeles and San Francisco has allegedly high concentrations of ozone. Yet typical crop damage there is reproduced only by ozonated olefins and not by ozone alone. Glasshouse grown crops can be

protected from damage by passing air through activated carbon filters. The response of plants to air pollution depends upon the type of pollutant present, its concentration, and the length of exposure to it. The specific symptoms incited by exposure to oxidants can be used to determine the presence of ozonated olefins and ozone in polluted air masses.##

03618

E. R. Stephens, E. F. Darley, O. C. Taylor, W. E. Scott

PHOTOCHEMICAL REACTION PRODUCTS IN AIR POLLUTION. Intern. J. Air Water Pollution 4, (1/2) 79-100, 1961. (Presented at the 25th Midyear Meeting, American Petroleum Inst. Division of Refining, Detroit, Mich., May 11, 1960.)

When low concentrations of simple olefins and nitrogen oxides in air are irradiated with artificial sunlight, the olefin molecule splits at the double bond. One end forms a carbonyl compound, and the other yields a variety of products. Among these is a highly oxidized, unstable organic nitrogen compound previously described as compound X or peroxyacetyl nitrite (PAN) and detected in polluted atmospheres. This compound has now been purified by gas chromatographic techniques, and its chemical, physical, and physiolcgical properties have been examined. At concentrations well below 1 p.p.m. in air, this compound produces damage symptcms on plants, similar to those observed from oxidant air pollution but different in some respects from the phytotoxicant from ozone-olefin reactions. PAN is the first pure compound isolated from photochemical reaction mixtures which has been found to produce the characteristic oxidant damage symptcms. It is also a strong eye irritant at concentrations in the 1 p.p.m. range and is therefore probably responsible, along with acrolein and formaldehyde, for the eye irritation in photochemical air pollution. (Author abstract)##

03626

03626

G. W. Todd

EFFECT OF LOW CONCENTRATION OF OZONE ON THE ENZYMES CATALASE, PEROXIDASE, PAPAIN AND UREASE. Physiol, Plantarum 11, 457-63, 1958.

The present work concerns the action of ozone on enzymes. An attempt has been made to estimate the actual quantity of ozone required for inactivation. The enzymes catalase, peroxidase, papain and urease were treated in vitro with low concentrations of ozone gas. Wide variations were found in the sensitivity of the

enzymes to the inhibitory action of the gas. Papain showed the greatest sensitivity; the rest required a much greater amount of ozone for inactivation. Comparisons of ozone and hydrogen peroxide as inhibitors of papain and urease showed ozone to be 30 times as effective as hydrogen peroxide on papain and 3 times as effective on urease. (Author summary modified)##

03627

G. W. Todd

EFFECT OF OZONE AND OZONATED 1-HEXENE ON RESPIRATORY AND PHOTOSYNTHESIS OF LEAVES. Plant Physiol. 33, (6) 416-20, Nov. 1958.

The treatment of Pinto bean leaves with either ozone or ozonated hexene gas in air caused a rise in the respiration rate up to more than four times that of untreated control leaves. Plant responses to the two gases were similar. The rate of photosynthesis of treated bean leaves was less than that of controls. Both the amounts of stimulation of respiration and the inhibition of photosynthesis were directly related to the development of visible injury symptoms in certain tissues of the bean leaves. No stimulation of bean leaf respiration or inhibition of photosynthesis occurred unless visible injury developed. However, ozone caused a rise in the respiration rate of Valencia orange leaves with no concomitant development of visible injury. Citrus leaves gave no response until ozone concentrations approached those required to produce visible injury symptoms. Treatment with ozonated hexene at concentrations eliciting changes in respiration and photosynthesis in bean leaves caused no change in these processes in citrus leaves. A comparison of ozone- and ozonated hexene-treated bean leaves showed that the respiratory quotients were not different from that of the control leaves. (Author abstract)##

03628

G. W. Todd, J. T. Middleton, and R. F. Brewer

EFFECTS OF AIR POLLUTANTS: Calif. Agr. 7-8, 14, July 1956.

Symptoms of plant damage in the field can often be identified as the effect of one or more air pollutants. However, the exact mechanisms whereby the plant is damaged and the various manifestations of damage - after fumigation with air toxicants - are not well understood. Some forage and vegetable crops, alfalfa, common bean, garden and sugar beet, lettuce, spinach, and tomato, grow and yield poorly in polluted atmospheres such as Los Angeles and San Francisco. Reduced growth and production can occur without leaf necrosis. Effects on plant life processes were investigated. Treatment of the small aquatic plant, Lemna or duckweed, with ozonated hexene and ozone showed a decrease in chlorophyll content and reduced photosynthesis. Studies on the

effects of ozonated hexene and ozone on the respiration of lemon fruit showed respiratory stimulation, particularly upon treatment with ozonated hexene. Changes in membrane permeability were studied by exposing table beet, bean leaf and potato tuber tissue to ozonated hexene. In the case of the beet tissue, the changes brought about caused the anthocyanin pigment of the beet to diffuse out when the tissue was placed in water. Ozonated hexene first caused a decrease then followed by an increase in permeability in the potato and bean tissues. Exposure to ozone and ozonated gasoline caused reduction in growth of Kentia palms and Todd Mexican avocado seedlings.##

03629
G. W. Todd

PHYSIOLOGICAL RESPONSES OF PLANTS TO AIR POLLUTANTS. J. Appl. Nutr. 10, 456-8, 1957. (Presented at the 20th Annual National Convention, American Academy of Nutrition, Los Angeles, Calif., 1956.)

The mechanisms whereby plants are damaged and the various ways in which they may show manifestations after fumigation by air pollutants are reviewed. The discussion is primarily concerned with the effects of ozone, ozonated unsaturated hydrocarbons, naturally-occurring air pollutants in the Los Angeles basin, and to a small extent hydrogen fluoride.##

03630

G. W. Todd and H. J. Garber

SOME EFFECTS OF AIR POLLUTANTS ON THE GROWTH AND PRODUCTIVITY OF PLANTS. Botan. Gaz. 120, (2) 75-80, Dec. 1958.

Fumigations with ozonated hexene caused a repression in growth of bean plants (varieties Red Kidney and Bountiful) even though they showed no visible symptoms of injury. This effect was evident from measurements of linear growth, leaf area, fresh and dry weights, and fruit production. Both primary and trifoliolate leaves failed to enlarge as much as control leaves when treated with ozonated hexene, although the treatment seemed to have little or no effect on the number of leaves inititated. Primary leaves on treated plants aged and were lost prematurely. Stems of plants treated with ozonated hexene consistently had a higher water content than did stems of control plants. The leaves did not show this relationship. The height growth of pea plants (variety Alaska) was slowed temporarily by as little as a single half-hour fumigation with ozonated hexene, although treated plants fully recovered and were growing normally 1 or 2 days later. Ozone alone caused no repression of growth, and repeated fumigations of pea plants with 1-hexane elicited no response. (Author summary)##

03695

R. A. Bobrov

CORK FORMATION IN TABLE BEET LEAVES (BETA VULGARIS) IN RESPONSE TO SMOG. Proc. Natl. Air Pollution Symp., 3rd Pasadena, Calif., 1955. pp. 199-205

Table beet (Beta vulgaris) leaves produce an abnormal corklike layer, the cicatrice, on their lower surface in response to smog. This is due to a series of cross walls which cut in parallel to the broad surface of the leaf in normally static, spongy mesophyll cells. Following exposure to smog, a limited number of cells surrounding the substomatal chambers on the lower leaf surface become dehydrated. Anthocyanin increases in the damaged areas and lower epidermal cells may collapse. The walls of the initially damaged cells, those of the collapsed epidermal cells, and intercellular spaces between become heavily suberized, sealing the lower surface of the leaf. Sudan III stains this region readily lower surface of the leaf. Sudan III stains this region readily. This layer is properly designated the pseudocicatrice. All and functional; the only abnormality is in the region of accelerated suberization. The cells of the lower spongy mesophyll in the immediate vicinity of damage begin to divide by tangential walls to form a cicatrice parallel to the flat surface of the blade. These new walls are at first pure cellulose. As they grow older, they become more and more heavily suberized. By compression against one another as the mother cell continues to form new walls above, a heavily suberized protective cork layer, the cicatrice, is formed. This stimulation to unusual wall formation in cells, which under normal conditions would not enlarge or divide, is definitely in response to tissue trauma. Renewed cellular activity cannot be blamed directly on the toxicity of a smog component. Indirectly, however, by causing the death of some cells, it may induce chemical changes within the leaf, which, in turn, induce the formation of cork. (Author summary)##

03696

R. B. Glater, R. A. Solberg, and P. M. Scott

A DEVELOPMENTAL STUDY OF THE LEAVES OF NICOTIANA GLUTINOSA AS RELATED TO THEIR SMOG-SENSITIVITY. Am. J. Botany 49(9):954-970, Oct. 1962.

Plants growing in the fields of Los Angeles County as well as those experimentally fumigated in the laboratory show gross markings in response to smog which vary from species to species, from a glistening appearance of the leaf undersurface due to a temporary accumulation of water in the affected cells through complete necrosis. In dicotyledonous leaves, "silvering," "bronzing," brown-black mottling or an increase in anthocyanin may be seen. In monocotyledons, transverse banding, tan in color, or longitudinal streaking of leaves are the usual responses. This damage appears in a characteristic pattern on the leaves, different

from that produced by other phytotoxicants. Nicotiana glutinosa plants were grown in the air-filtered greenhouses at UCLA. The normal anatomical development of the foliage was studied and correlated with its susceptibility to smog injury. On a given plant, leaves of different ages show damage in different positions. Very young leaves at the apex of the plant and old leaves at the base of the plant are not sensitive. Expanding leaves between young and old in age are sensitive; in this group a distinct pattern of damage is discernible. Damage markings in the youngest leaves appear only at the tip; in leaves somewhat older, close to midblade; in fully mature leaves, only at the base. This localization of damage is shown to be correlated with the gradient of cellular differentiation from tip toward base as the leaf matures. Those cells which have just attained maximum size (young mature) are sensitive; damage, therefore, is a function of cellular development and maturity. The following anatomical details were analyzed: (1) differentiation and distribution of stomata and their opening and closing on both upper and lower epidermal surfaces and (2) development of intercellular air spaces in palisade and spongy parenchyma tissue. These studies indicate that damage occurs in the region of the leaf where stomata have just become functional and ambient polluted air can make direct contact with interior leaf tissues by virtue of large substomatal chambers and intercellular air spaces. (Author abstract)##

03697

R. A. Bobrov

THE LEAF STRUCTURE OF POA ANNUA WITH OBSERVATIONS ON ITS SMOG SENSITIVITY IN LOS ANGELES COUNTY. Am. J. Botany 42, 468-84, May 1955.

Annual bluegrass (Poa annua L.) is very sensitive to certain phytotoxic agents present in smog and might be useful as a bioassay indicator plant. In the field, the characteristic response to hydro-carbon-oxidation products is seen to be a tan spotting or transverse banding limited to the region between tip and midblade of susceptible leaves. This damage has been duplicated in the laboraroty with synthetically-produced smog. Tissue damage is similar to that previously described in spinach, beets, oats and other plants. The cells which are initially and most seriously damaged are those surrounding the substomatal chambers. Chloroplasts disintegrate, plasmolysis follows, and ultimate total dehydration of damaged cells results in part or all of the mesophyll tissue in affected areas becoming "mummified." In plants having a high specific sensitivity to smog, damage is correlated with stomatal distribution and activity, volume of inter-cellular air space and age of cells. Localization of damage is related to the gradient of cellular differentiation from tip to base in the linear leaf; the sensitive region is limited to those cells which have just completed maximum expansion. (Author summary)##

03698

R. A. Bobrov

USE OF PLANTS AS BIOLOGICAL INDICATORS OF SMOG IN THE AIR OF LOS ANGELES COUNTY. Science, 121(3145):510-511, April 8, 1955.

Poa annua is considered a very reliable biological indicator for atmospheric smog for several reasons: (i) the extreme sensitivity of its cells to minute quantities of phytotoxic materials; (ii) its method of cellular differentiation from tip toward base in the linear leaf with resulting marked transverse leaf banding; and (iii) its ubiquity as a weed in Los Angeles County, making a naturally occurring check available in many and scattered areas. Work is in progress in an attempt to calibrate this plant as a quantitative, as well as a qualitative, bioassay material. A detailed account of the anatomy of normal and smog damaged Poa has been completed.##

03700

R. A. Bobrov

THE EFFECT OF SMOG ON THE ANATOMY OF OAT LEAVES. Phytopathology 42, (10) 558-63, Oct. 1952.

Smog in the Los Angeles area causes serious damage to the oat crop. Damage depends upon the normal anatomical pattern of the parallel-veined leaf, upon the stomata as a portal of entry for the harmful elements in the air, and upon the amount of internal air space in the leaf. Initial damage may be observed microscopically, as the cells directly lining the substomatal chambers shrink. As more and more cells are affected, longitudinal streaking of the leaves occurs, corresponding to the position of the stomatal zones. Ultimate browning and death of the entire blade may results. The extent of injury is in proportion to the concentration of smog in the air. (Author abstract)##

03961

W. W. Heck and J. A. Dunning

THE EFFECTS OF OZONE ON TOBACCO AND PINTO BEAN AS CONDITIONED BY SEVERAL ECOLOGICAL FACTORS. J. Air Pollution Control Assoc. 17, (2) 112-4, Feb. 1967.

Environmental factors have a determining influence on the sensitivity of plants to ozone as an air pollutant. The effect of several environmental and related factors has been reported as preliminary to a further study of multiple factor interactions and eventual application to field conditions. Plants grown under a short photoperiod and low light intensity are more sensitive to ozone than those grown under a long photoperiod and a high light intensity. The sensitivity of tobacco or pinto bean to ozone, as an air pollutant, is increased by growing plants in a shortened photoperiod under reduced light intensity and in a light potting

mix. Sensitivity also is influenced by CO concentration, time of day, and age of plant at time of exposure. Tobacco shows cumulative development of injury when exposed to low concentration intermittently over several days.##

04476

S. Rich

OZONE DAMAGE TO PLANTS. Ann. Rev. Phytopathol. 2, 253-66, 1964.

The following aspects of ozone injury to plants are reviewed: Natural sources of ambient ozone; what plant species are susceptible; the symptoms produced; environmental predisposition; metabolic effects; and how plants may be protected.##

04544

H. E. Stokinger

EFFECT OF AIR POLLUTANTS ON WILDLIFE. Conn. Med. 27, (8) 487-92, Aug. 1963.

A review of information derived from both field and laboratory investigations of the effects of air pollutants on terrestrial animals indicates that (1) of all known air pollutants, economic poisons pose the greatest current threat to the health of wildlife. (2) Inorganic substances, (certain heavy metals and fluorides), account for limited and local injury to wildlife based on known effects on domestic animals. (3) The hazard to wildlife is chiefly from ingestion of the "fallout" of the air pollutant. (4) Relative species susceptibility to specific air pollutants is far from clear, but it would appear that the mammals are considerably more susceptible than birds. (5) Laboratory studies have revealed three rather general phenomena associated with exposure to air pollutants: a. Synergism, the exalted or potentiated toxic effect of combination of certain air pollutants: its converse, antagonism, in which the summated toxicity is either far less than predicted or nonexistent. b. Tolerance and cross tolerance to pulmonary edema-producing agents. c. The immunochemical response.##

04576

W. M. Dugger, Jr., J. Koukol, W. D. Reed, R. L. Palmer

EFFECT OF PEROXYACETYL NITRATE ON C14O2 FIXATION BY SPINACH CHLOROPLASTS AND PINTO BEAN PLANTS. Plant Physiol. 38, (4) 468-72, July 1963.

Photosynthetic CO2 fixation in pinto bean plants and in intact spinach chloroplasts was inhibited by peroxyacetyl nitrate, a component of photochemical smog. Addition of ascorbate to the chloroplast-containing reaction mixtures virtually eliminated this inhibition. Exposing the chloroplasts or other components of the reaction, either separately or as a mixture, to peroxyacetyl nitrate in the dark followed by a light period without the oxidant did not effect the C1402 fixation process. This inhibition in the intact plant, as well as in the chloroplast, appears to be one of quantitative reduction in the early products of the photosynthesis and not a qualitative change. (Author summary) ##

04582

H. E. Heggestad J. T. Middleton

OZONE IN HIGH CONCENTRATIONS AS CAUSE OF TOBACCO LEAF INJURY. Science 129, (3343) 208-9, 1959.

Evidence obtained by means of rubber strip tests and on ozone recorder indicates the presence of abnormal concentrations of ozone in the atmosphere at times. Excellent correlation was obtained between appearance of "weather fleck" in tobacco and high values for ozone. The great similarity between lesions occurring naturally and those produced by ozone in chambers also indicates that ozone is the probable inciting agent of weather fleck. Varietal differences exist. Study of stomatal action helped to explain variation in leaf injury. ##

04684

M. C. Ledbetter, P. W. Zimmerman, and A. E. Hitchcock

THE HISTOPATHOLOGICAL EFFECTS OF OZONE ON PLANT FOLIAGE. Contrib. Boyce Thompson Inst. 20 (4) 275-82, Dec. 1959

Young plants of 32 species and varieties that were growing vigorously in the greenhouse were exposed to ozone at concentrations of 0.1 to 1.0 p.p.m. in a circulating stream of washed air. In descending order of susceptibility the plants were tomato, bean (Pinto), tobacco (Maryland Mammoth), spinach, potato, smartweed, stevia, tobacco (Vamorr 48), chrysanthemum (Pippin), hypericum, alfalfa, peanut, tobacco (Turkish), sweet potato, sensitive plant, grape, verbena, chrysanthemum, Jerusalem cherry, avocado, sugar-beet, strawberry, mint, and geranium. Under the conditions of this test, gladiolus, kalanchoe, pepper, bean (Tendergreen), and piggy-back plant were not visibly injured by concentrations up to 1.0 p.p.m. Foliage injury appeared in varying amounts as dark stipples, light flecks, necrotic patches, and general chlorosis. The dark

punctate markings were shown to be due to pigmentation and thickening of cell walls in the palisade area. The light-colored flecks were associated with a collapse of the palisade cells without pigment formation. The necrotic areas were found to consist of general injury to all cells between and including the epidermis in the affected area. In general, very young leaves that had no functional stomata were resistant to ozone. The leaves become susceptible only as the stomata become functional. In variegated coleus injury was largely associated with the pigmented sectors presumably due to the greater functioning and frequency of the stomata, or to the greater sensitivity of these tissues to ozone. (Author summary)##

C4707

L. Ordin and M. A. Hall

STUDIES ON CELLULOSE SYNTHESIS BY A CELL-FREE OAT COLEOPTILE ENZYME SYSTEM: INACTIVATION BY AIRBORNE OXIDANTS. Plant Physiol. 42, (2) 205-12, Feb. 1967.

Particulate cell wall polysaccharide synthetase from oat coleoptiles could use either guanosine diphosphate glucose or uridine diphosphate glucose; the latter was a much more effective glucose donor. The neutral polymer derived from uridine diphosphate glucose utilization yielded, after cellulase digestion, mostly cellobiose and to a lesser extent a substance tentatively identified as a mixed-linkage beta 1,4 = beta 1,3-trisaccharide; only cellobiose was found after guanosine diphosphate glucose utilization. The uridine diphosphate glucose utilizing system was inactivated by peroxyacetyl nitrate treatment of intact tissue and to a lesser extent by ozone treatment suggesting that this system is a possible site of interference with cellulose and non-cellulosic glucan biosynthesis in vivo. Direct treatment of the enzyme in vitro by peroxyacetyl nitrate, iodoacetamide or p-chloromercuribenzoate also inactivated the enzyme, indicating that the mechanism of inactivation possibly involves reaction with sulfhydryl groups. (Author abstract)##

04724

W. W. Thomson, W. M. Dugger, Jr., and R. L. Palmer

EFFECTS OF OZONE ON THE FINE STRUCTURE OF THE PALISADE PARENCHYMA CELLS OF BEAN LEAVES. Can. J. Botany. 44 1677-82, 1966.

The effects of ozone on the fine structure of palisade parenchyma cells were of two phases. The first phase involved changes in the chloroplast stroma which consisted of eigher a granulation and an increase in electron density or a formation of ordered arrays of granules and fibrils. In the second phase, there was a general disruption of the cellular membranes and

organelles and the cellular contents aggregated in the center of the cells. The characteristic components of this aggregate were remains of the chloroplast membrane system and numerous ordered arrays of granules and fibrils. These changes were identical with those previously observed in cells damaged by peroxyacetyl nitrate and were probably related to the oxidation properties of both molecules. In some cells there was a disruption of the organization of the grana within the chloroplasts. (Author abstract) ##

04853

C. R. Thompson, and O. C. Taylor

PLSTIC-COVERED GREENHOUSES SUPPLY CONTROLLED ATMOSPHERES TO CITRUS TREES. Trans. ASAE (Am. Soc. Agr. Engrs.), 9(3):338-339, 342, 1966. 5 refs.

Details of a greenhouse for studies of air pollution (smog) on individual fruitbearing citrus trees are described. A structure was needed for this purpose that would endure for a minimum of five years, would admit the entire solar spectrum, and would not become excessively overheated when outside temperatures rose to 115 F. After three years of operation, the durability and convenience of the structures described are very satisfactory. No discoloration, crazing or cracking of the plastic glazing material is apparent. Paint on the aluminum is holding well. Repainting on some steel surfaces was necessary after two years. Activated carbon and limestone for removing photochemical smog and fluorides, respectively, from the air streams must be renewed about every 12 hours. Some minor damage was done by windstorms of 80 mph, which was easily taken care of.##

C4998

H. M. Hull F. W. Went

LIFE PROCESSES OF PLANTS AS AFFECTED BY AIR POLLUTION. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 122-8.

Either natural smog or artificial smog produced by the ozonization of 1, n-hexene or gasoline was used. Plants used included: alfalfa, var. Chilian; sugar beet, var. U.S. 22/3; endive, var. Pink Ribbed; oats, var. Kanota; spinach, var. Viroflay; and tomato, var. San Jose Canner. A sensitive biological assay for detection of phytotoxic constituents in the atmosphere is described. Differential sensitivity of cotyledons and young foliage leaves to smog injury was observed. The growth of alfalfa, and especially of endive, has been greatly increased by carbon filtration of the atmosphere. Tomato plants" growth was very

significantly greater in the carbon-filtered air. An iron-zinc-steel wool filter was practically as efficient as the activated carbon, as indicated by the luxurious growth of all five plants. The effect of smog cn growth, transpiration, and stomatal behavior was examined. The effects of temperature, illumination, humidity, and soil moisture on the sensitivity of the plants to smog was studied. The effect of ferrous sulphate, stannous chloride and sucrose sprays upon the plants' susceptibility to smog injury was studied. The sensitivity of several different species of plants and of different types of spinach to smog damage was investigated.##

04999

R. A. Bobrov

THE ANATOMICAL EFFECTS OF AIR POLLUTION ON PLANTS. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, b8calif., 1952. pp. 129-34.

The damaging effects on the leaf anatomy of susceptible crop plants were investigated. The leaf was considered to be the logial point of departure, since it almost invariably manifests physical response to smog within a very brief exposure period. The structure of the normal leaves was very carefully observed in order to enable detection of even the slightest alteration in cell shape. From careful comparative studies made of the cellular structure of normal and damaged leaves, it was possible to establsih the microscopic anatomy of smog damage. Regardless of the macroscopic picture of damage, microscopic studies indicate that the reaction of the cell to hydrocarbon-ozone products is the same in all susceptible plants. The plants studied were table beet, sugar beet, romaine lettuce, spinach, Swiss chard, endive, oats, and corn.##

05096

J. B. Mudd., and T. T. Mcmanus

PARTICIPATION OF SULFHYDRYL GROUPS IN FATTY ACID SYNTHESIS BY CHLOROPLAST PREPARATIONS. Plant Physiol. 39, (1) 115-9, Jan. 1964.

Preparations of broken spinach chloroplasts incorporate acetate and malonate into long chain fatty acids. Avidin inhibits the incorporation of acetate but not of malonate. The ability to catalyze the incorporation of these precursors declines as the preparations age. This deterioration is associated with the soluble enzymes, rather than the fragments of the chloroplasts. The aging effect can be prevented to some extent by glutathione, which also alters the composition of the labeled fatty acids, favoring stearate and decreasing palmitate and oleate. Sulfhydryl reagents (p-chloromercuribenzoate, cadmium ions, arsenite) inhibit

the incorporation of acetate and malcnate into lipid. At higher concentrations the sulfhydryl reagents inhibit the incorporation into non-volatile water soluble ccmpcunds. The inhibition by p-chloromercuribenzoate and cadmium ions can be reversed by reduced glutathione. The inhibition by arsenite is enhanced by the presence of 2,3-dimercaptopropanol. (Author summary)##

05103

W. M. Noble

THE RELATION OF PLANT DAMAGE TC FUEL COMPOSITION. Preprint. (Presented at the Jcint Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5, 1961.)

Plants exposed to irradiated autc exhaust gases containing initially less than 0.5 ppm of olefins and less than 2 ppm of NO exhibit the same symptcms of damage as do plants exposed to the atmosphere in the Los Angeles area. The plants used in these studies were Poa annua and petunia, var. Rosy Morn. The symptoms observed were banding, necrosis, glazing, silvering, and cellular plasmolysis in substomatal regions. Exposure time was 1 hour. Exposures were initiated at half hour intervals. Poa annua was the most useful plant because of its greater range, simplicity of evaluation, and uniformity and also because a larger number of plants could be used in a given space. The length of exposure required fcr the production of maximum damage appears to be related to the reaction rate of the fumigants, which depends in part on fuel bromine number and on the concentrations of the fumigants. Differences in concentrations also produced marked differences in the degree of damage. (Author abstract)##

05131

I. J. Hindawi

THE PRCDUCT OF PHOTOCHEMICAI REACTICN AS REFLECTED ON VEGETATION GRCWN IN BROOKLYN BOTANICAL GARDENS . Willowbrock, New York; Roselle and Baycnne, New Jersey. Preprint. (Presented at the Cooper Union Colloquim, New York City, Apr. 17, 1967.)

In an attempt to observe ozone attack on sensitive vegetation grown under controlled conditicns, specially designed greenhouses were located, from July 18, 1966, through October 5, 1966, in New York and New Jersey. The test plants were grown under hydroponic conditions in a vermiculite support medium containing prepared nutrient solution. The test plants were exposed to ambient air by circulating fans designed to provide one complete change of air volume every minute. Two plants of each of tobacco, pinto bean, geranium, petunia, begcnia, and cotton were placed in each greenhouse. The type of damage that developed during exposure to natural pollutants could be attributed to ozone and

PAN and also to interactions of low concentrations of these toxicants and others. It was found that the plants were significantly more sensitive during the mid-portion of the day than at either extreme. In addition to tissue destruction, the growth of geranium, petunia, begonia and pinto bean plants grown at the four stations was severely suppressed, whereas comparable plants grown in the control station with activated-carbon filters had longer leaves, a wider stem, darker green color, and a generally more vigorous growth appearance. Two years of study and observation have indicated definite evidence of plant damage from ozone to PAN in the Metropolitan New York Area.##

05279

F. D. H. MacDowall, E. I. Mukammal, and A. F. W. Cole

DIRECT CORRELATION OF AIR-POLLUTING OZONE AND TOBACCO WEATHER FLECK. Can. J. Plant Sci. (Ottawa) 44, 410-7, Sept. 1964.

Influxes of polluted air and attacks of tobacco weather fleck in southwestern Ontario were accurately forecast from the synoptic weather pattern and from considerations of mesoscale meterological systems. However, the principal air pollutant, ozone, occurred daily at low concentrations that were often not followed by corresponding amounts of damage. This difficulty was largely removed by modification of the dose term with the coefficient of evaporation. The latter may empirically represent physiological and physical factors affecting gas exchange. A related downward flux of ozone might be important in determining the amount of ozone available for absorption. The threshold doses of air-polluting ozone and experimentally generated ozone were approximately the same. (Author abstract)##

05342

Darley, E. F., Nichols, C. W. and Middleton, J. T.

IDENTIFICATION OF AIR POLLUTION DAMAGE TO AGRUCULTURAL CROPS. (AIR POLLUTION RESEARCH REVEALS CHEMICAL TOXICANTS INJURING VEGETATION IN POPULOUS AREAS OF CALIFORNIA.) Calif. Dep. Agri. Bull., 55(1):11-19, 1966.

The subject of this paper is the damage air pollution does to the plants that feed us, clothe us and please our aesthetic sense. This damage is considerable. Estimates of visible damage to agrucultural crops amount annually to about $8 million in California and approximately $18 million along the Atlantic seaboard. Damage to vegetation has increased with industrialization and urban development. Several decades ago sulfur dioxide and fluorine were recognized as the principal plant toxicants. These two gases continue to be very important but within the last 20 years a new group of toxicants has been identified. These are products of atmospheric photochemical reactions between

hydrocarbons and nitrogen oxides. The principal products of these reactions are ozone and the peroxyacyl nitrates (PANs). The distribution of plant damage in California shows that it occurs only in recognized geographical areas which, in each instance, are located within airsheds. Because damage to plants is often the first indication of air pollution, it is important that the surveillance of pollution damage to agriculture be continued. Such information will help communities, in their planning, to take cognizance of the relationship between the air ressource and the community needs for commercial and industrial development, energy production, fuel usage and transportation, agriculture, and forest and recreation land. The air contaminants responsible for damage may be either particulate or gasecus in nature. The greatest amount of damage to animals and vegetation is usually caused by gaseous air contaminants which directly injure plants and indirectly injure animals by the toxic effects produced after the animal has consumed contaminated forage and food supplements.

05344

Darley, E. F., and Middleton, J. T.

PROBLEMS OF AIR POLLUTION IN PLANT PATHOLOGY. Ann. Rev. Phytopathol. 4, 103-18, 1966.

Air quality affects plant growth and development. Whereas oxygen is necessary for aerobic plant respiration and carbon dioxide is necessary for photosynthesis in green plants, a number of pollutants may alter plant metabolism and incite disease. It is the purpose of this paper to enumerate some of the principal air pollutants which adversely affect plant growth and reproduction, to describe the diseases incited by them, and to identify some of the problems of air pollution in phytopathological research. A primary responsibility of the pathologist is to alert agriculturists of impending air-pollution problems, so that social action may be taken to insure the continued productivity of crop, pasture, and forestry enterprises. Another responsibility, because plants are early indicators of an air pollution problem, is to assist public health and resource agencies in the planning, conduct, and evaluation of air-pollution abatement programs. Plant pathologists must become increasingly concerned with the effects of air quality on plant growth.

05362

Dugger, W. M. Jr., Taylor, O. C., Cardiff, E., and Thompson, C. R.

RELATIONSHIP BETWEEN CARBOHYDRATE CONTENT AND SUSCEPTIBILITY OF PINTO BEAN PLANTS TO OZONE DAMAGE.
Proc. Am. Soc. Hort. Sci. 81, 304-15, 1962.

Evidence is presented to substantiate the hypothesis that ozone damage to the leaves of pinto bean plants is associated with the

sugar concentration in the leaves at time of exposure to ozone. These are: (a) leaf damage from ozone may be prevented by a dark period sufficient to reduce the sugar content to a low level and then reversed by supplying sugar to the leaves through leaf or cut stem absorption; (b) plants grown in a 12 hour photoperiod and susceptible to ozone damage may be protected by supplying additional sugar through leaf or root absorption; (c) young (less than 7 days) and old leaves (greater than 14 days) are not damaged by ozone and soluble sugars are high in these plants. Only when the sugar level is reduced to a level less than about 4 mg/g fresh weight and not less than about 1.0 mg/g fresh weight will ozone damage occur; and (d) young plants not susceptible to ozone and containing a high level os sugar, are made susceptible to the gas by removing the cotyledons and reducing the soluble leaf sugars. Eight day old plants with or without cotyledons, are equally damaged by ozone and have the same concentration of sugars. The relationship of this hypothesis to previous reports on ozone damage to plants is discussed with a view toward explaining the variability in observed damage in the field as well as greenhouse studies. (Authors' summary)

05420

Daines, R. H., I. A. Leon, and E. Brennan

AIR POLLUTION AND PLANT RESPONSE IN THE NORTHEASTERN UNITED STATES. In: Agriculture and the Quality of Our Environment. Brady, N. C. (ed.), American Association for the Advancement of Science, Washington, D. C. AAAS-Pub-85, p. 11-31, 1967. 56 refs. (Presented at the 133rd Meeting, American Association for the Advancement of Science, Washington, D. C. Dec. 1966.)

A review of pollutants that have been found to elicit plant response is confined to the discussion of acid gases, primary products of combustion, and products of reactions occurring in the atmosphere. Other topics discussed include: plant response as an indicator of meteorological conditions and the fuels used for heat, light, and power.##

C5422

Landau, E.

ECONOMIC ASPECTS OF AIR POLLUTION AS IT RELATES TO AGRICULTURE. In: Agriculture and the Quality of Our Environment.-Brady, N. C. (ed), American Association for the Advancement of Science, Washington, D. C. AAAS-Pub-85, p. 113-126, 1967. 23 refs. (Presented at the 133rd Meeting, American Association for the Advancement of Science, Washington, D. C. Dec. 1966.)

A review of the economic considerations of air pollution damage to

agriculture is presented. Estimates of benefits and cots are absoutely essential to the development of effective control measures for air pollution. The basis for the estimates of damage to crops and livestock because of phytotoxicants is vague and ill defined, existing only for selected areas of the United States and for damage to specific crops. Hence, the overall extrapolation is based on limited data. The sources of information for previous accounts of damage exist only for geographically limited areas. Well-known court action such as the Trail Smelter Case (British Columbia) and the Ducktown Case (Tennessee) are the sources of information on extensive local damage. These and other cases illustrate the weakness of this type of resolution of the problem of external diseconomy. In the United States, laboratory studies of sulfur dioxide have generally been limited to acute effects that cause visible damage. Little concern has been manifested for chronic effects, particularly if visible damage was not observed. Only very recently, owing primarily to the stimulus of German research findings, has interest developed over chronic or growth effects. There is also a possibility of a potentially greater nutritional threat to crops, which may not be currently reflected in market prices. Because the existing national estimates of crop damage have severe limitations, a substantial underestimate may result from their focus on observed damage. Should the national estimates of crop damage be needed, and they are needed for legislative and political considerations, there will inevitably be a long delay until reliable state and regional estimates on which they must be based can be prepared.##

05485

W. M. Noble

AIR POLLUTANTS. Lasca Leaves. 15 (1), 7-18 (Jan. 1965).

After years of careful study, some of the components of smog have been sorted out. The more important ones, their effects on vegatation, and a list of sensitive and resistant plants are discussed. The components are peroxyacetyl nitrate, ozone, ethylene, hydrogen fluoride, sulfur dioxide and aerosols.##

05558

H. A. Rodenhiser

EFFECTS OF AIR POLLUTION ON CROPS AND LIVESTOCK. Preprint. (Presented at the National Conference on Air Pollution, Washington, D.C., Dec. 10-12, 1962, Paper D-3.)

The damage done by air pollutants is costly both to farmer and consumer. The sensitivity of plants and trees to various pollutants (fluoride, sulfur dioxide, PAN, and nitrogen oxides)

is discussed, with emphasis on current and future research efforts to erradicate these pollutants. Although there is no good measure of the total national loss from air pollution, fugures have been published for some localties. In Southern California, for example, loses of vegetation due to oxidants are thought to be around 10 million dollars a year. This includes only the readily demonstrated loses of vegetable crops downgraded because of markings or left unpicked in the field. The general conclusion is that air-pollution research in the field of agriculture must move ahead before a greater gap is created in this area.##

05560

C. R. Berry

EASTERN WHITE PINE-EVERGREEN MONITOR OF AIR POLLUTION. Preprint. (Presented at the Second National Conference on Air Pollution, Washington, D.C., Dec. 12-14, 1966.)

Six hundred healthy, 2-year-old seedlings were potted and taken to Morgan County, Tenn., where they were installed near a power plant known to be the sulfur dioxide source. After a year of exposure, 106 of the trees had died, either from handling, air pollution damage, or both. Those surviving included 183 that were free of damage and 106 that were only slightly injured. These were presumed resistant to sulfur dioxide and were taken to the Alabama test area for exposure to fluorides. The remaining 202 trees showed serious damage, so they were returned to the recovery area in North Carolina. After a year of exposure in Alabama, 157 injured trees were again removed and sent to North Carolina for recovery. The remaining 26 seedlings still appeared healthy, and they were presumed to be resistant to both sulfur dioxide and fluorides. The healthy trees were moved to Beltsville, Md., where they are still under exposure to oxidants produced by heavy motor traffic. Although, the exposure period is not over, and final figures may be different, 13 trees have been injured and 13 still appear healthy. It is hoped that seedlings from seed of superior trees will be inherently resistant to damage from sulfur dioxide, fluorides, oxidants, and other airborne toxicants. On the other hand, susceptible trees that recover in the clean air in North Carolina may make excellent assay plants because of their demonstrated sensitivity to oxidants at Beltsville. The results of these tests indicate there is enough genetic variation in a large eastern white pine population to provide biological indicators for specific toxicants. ##

C5610

W. W. Heck

PLANT INJURY INDUCED BY PHOTOCHEMICAL REACTION PRODUCTS OF PROPYLENE-NITROGEN DIOXIDE MIXTURES. J. Air Pollution

Control Assoc. 14(7):255-261, July 1664. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

Plants developed typical ethylene injury symptoms when fumigated for 21 to 48 hr with ethylene or various combinations of ethylene, acetylene, propylene and nitrogen dioxide. When propylene and nitrogen dioxide were included in the gas mixture and the mixture irradiated typical oxidant symptoms were recorded. Slight to severe necrotic spotting, due to nitrogen dioxide, was noted in a 48 hr fumigation at one ppm nitrogen dioxide and in a 21 hr fumigation at 3.5 ppm nitrogen dioxide. Twelve hour fumigations using irradiated mixtures of ethylene, acetylene and propylene at three concentrations (2,4, and 8 ppm) each in combination with one ppm of nitrogen dioxide gave typical oxidant damage with only the propylene-nitrogen dioxide mixtures. From reported oxidant injury symptoms the propylene-nitrogen dioxide irradiated mixture produced plant injury which is typical of both ozone and PAN. The presence of other phytotoxicants was not dicounted but the severity of injury, under the conditions used, made it difficult to evaluate other possible types of oxidant damage. The production of the phytotoxicants using various ratios of propylene-nitrogen dioxide mixes was determined using the plants as biological indicators. A ratio of one ppm NO2 to 2-3 ppm propylene produced the highest concentration of the phytotoxicants. The effects of varying light and temperature conditions during the fumigation period indicated that plants must be in the light before they are sensitive to oxidant damage and that a temperature above or below normal will reduce oxidant injury. Results stress the need for studying the interrelations of oxidant injury and various environmental factors. (Author's summary)##

05666

Brewer, R. F. Guillemet, F. B. and Creveling, R. K.

INFLUENCE OF N-P-K FERTILIZATION ON INCIDENCE AND SEVERITY OF OXIDANT INJURY TO MANGELES AND SPINACH. Soil Sci. 92, (5) 298-301, Nov. 1961.

The study reported in this paper was designed to further study the influence of nitrogen supply and explore the possible effects of potassium and phosphorus supply on the sensitivity of plants to oxidant damage. Several Mangel seed (Burpee No. 5131) were planted in 1-gallon cans filled with a previously fertilized soil-sand-peat mixture. After emergence the plants were thinned to one plant per can. Twelve different treatments, each replicated 8 times, were used in a 3 x 2 x 2 factorial design consisting of 3 levels of N and 2 each of P and K. Two months after emergence, half the plants, chosen at random, were placed in a special greenhouse fumigation chamber and exposed to ozonated hexene. The remaining mangels were placed in a duplicate fumigation chamber which received activated-carbon-filtered air to remove ambient oxidants. At the end of 2 days, during which the one group of plants was exposed to two 6-hour fumigations with an average organic oxidant concentration of 0.01 ppm., all the plants (fumigated and controls)

were returned to the smog-free greenhouse where they were grown. Thirty-six hours after fumigation was stopped the plants were systematically examined for incidence and severity of damage. A similar experiment was conducted using spinach as the test plant. A statistical analysis of the mangel fumigation data indicate that the severity of injury was very significantly increased as the nitrogen level was increased. There were also highly significant interactions of nitrogen with phosphorus and between phosphorus and potassium on severity of injury. The results of differential fertilization on the sensitivity of spinach to ozone injury indicate that increasing the nitrogen supply very significantly increased both the incidence and the severity of ozone injury. fertilization on the sensitivity of spinach to ozone injury.

05698

H. T. Freebairn and O. C. Taylor

PREVENTION OF PLANT DAMAGE FROM AIR-BORNE OXIDIZING AGENTS. Proc. Am. Soc. Hort. Sci. 76, 693-9 (1960).

In 1956 alone, the estimated loss to growers from the damaging agents in Los Angeles smog (one of which was ozone) amounted to more than $5,000,000. Therefore, it is important to investigate methods for counteracting the effects of oxidizing agents on plants and to understand the type of toxic reactions taking place. Under the right conditions vitamin C and reduced glutathione have the capacity to prevent the damaging action of ozone on in vivo and in vitro metabolic processes. The action of ozone on plant and animal mitochondria has been shown to be prevented and reversed by the addition of excess amounts of glutathione (reduced form) and ascorbic acid. The application of vitamin C to the leaves or roots of bean plants increased their tolerance to ozone fumigations. For demonstrating protection in the field, 12-day-old pinto bean plants, were transported from Riverside to a greenhouse in Montebello and to field locations in West Covina, and Chino, California. They were exposed during periods that air pollution occurred in these locations. The solutions being tested were prepared fresh before each spraying and were sprayed on the beans daily during the exposure period as well as the day before the plants were transported to the field. The plants were changed every three days, at which time the results were recorded. Commercially-grown petunia plants were raised under glass at the field locations in both flats and small aluminum containers. The plants were usually about 6 to 8 weeks old when the treatments were started. Analytical data indicated that a spray application of reduced vitamin C to the foliage of plants caused an increase in their vitamin C content. Potassium ascorbate sprays partially protected pinto beans, petunias, celery, romaine lettuce, grapefruit, Cleopatra mandarin, and Sampson tangelo from leaf injury caused by polluted air in and near Los Angeles. An increase in the weight of and the number of leaves on petunia plants was associated with the protection given by the vitamin C treatments.##

05723

J. B. Kendrick, Jr., E. F. Darley, and J. T. Middleton

CHEMOTHERAPY FOR OXIDANT AND OZONE INDUCED PLANT DAMAGE. Intern. J. Air Water Pollution 6, 391-402 (1962).

A number of common fungicides, as well as antioxidants from the rubber industry, were dusted and sprayed onto leaves of test plants to determine their efficacy, as well as their mode of action, in protecting plants from subsequent exposure to ozone and oxidants generated from ozonated hydrocarbons. Not all chemicals were equally effective. Some protected against both ozone and oxidants, some protected against one but not the other, while some gave no protection. The most effective materials were dithiocarbamates, mercaptobenzothiozole and their derivatives, while the least effective were amine derivatives. The degree of protection was directly related to concentration of chemical. Longevity of protection was related to accumulated periods of exposure to toxicants. Over a 10-hour accumulated exposure period plants were significantly protected, although the degree of injury gradually increased with exposure time. In contrast, when several days lapsed between application and exposure, the chemical was as effective as when applied on the day of exposure. Action of the protectant was local and not systemic; the toxicant appeared to be deactivated at the leaf surface. Leaves remained free of injury only when the chemical was applied to the lower leaf surface and then only on that portion actually covered with chemical. Some degree of protection was achieved in field tests against atmospheric oxidants as well as against those generated in the laboratory. (Author abstract) ##

05724

J. B. Kendrick, Jr., E. F. Darley, J. T. Middleton, and A. O. Paulus

PLANT RESPONSE TO POLLUTED AIR. Calif. Agr. 10 (8), 9-10 (Aug. 1956).

Field observations and controlled fumigation experiments have shown that plants differ in their response to atmospheric contamination by ethylene, herbicides, fluorides, sulfur dioxide, and smog, or oxidized hydrocarbons. Controlled experiments have also shown that plant response to air pollution varies with species and variety of plant, age of plant tissue, soil fertility levels, soil moisture, air temperatures during the prefumigation growth period, and presence of certain agricultural chemicals on leaves. Plants also vary in their susceptibility to sulfur dioxide, with alfalfa, barley, and cotton damaged at comparatively low levels, and citrus, corn, celery, and melons damaged at much higher levels. Field observations show that young leaves are seldom marked during periods of aggravated air pollution. The young, unexpanded leaves are typically uninjured; the mature, expanded leaves are severely

injured; and the old, somewhat chlorotic leaves are rarely damaged. In grasses, where the youngest tissue is at the base of the leaf, injury first occurs at the tip, grading off in intensity of injury toward the base of the leaf. Old chlorotic leaves on grasses are seldom injured. Several groups of chemical compounds are capable of preventing injury to plants caused by oxidized hydrocarbon fumigations when the chemicals are applied to the lower surface of leaves. These chemicals belong to the dithiocarbamate, benzothiazole, and thiuram sulfide groups, and have been used extensively as agricultural fungicides for the control of many fungus diseases. Two of the best chemicals for this purpose are zineb--zinc ethylenebisdithiocarbamate -- and thiram--tetramethyl thiuramdisulfide. The degree of protection is directly related to the amount of active ingredient contained in the spray or dust preparations. Protection is achieved only when the underside of leaves are adequately covered. Both groups of chemicals when properly applied to laboratory test plants protect leaves from damage from both ozone and ozonated hexene. Pinto bean leaves dusted with zineb in the laboratory and exposed to naturally polluted air near Los Angeles were protected from sericus injury.##

05745

Ordin, L., O. C. Taylor, H. E. Cropst, and E. A. Cardiff

USE OF ANTIOXIDANTS TO PROTECT PLANTS FROM OXIDANT TYPE AIR POLLUTANTS. Intern. J. Air Pollution 6, 223-37 (1962).

Single dusts of nickel di-N-butyl dithiocarbamate (35 percent), zinc ethylenebis (dithiocarbamate) (Zineb) (35 percent) or potassium ascorbate (6 percent) diluted with Pyrax ABB effectively protected lettuce and endive plants from a 2-hr. exposure to 1 ppm ozone. These substances had little or no effect on plants exposed to damaging concentrations of peroxyacetyl nitrate. The carbamates protected Pinto beans from ambient oxidants under conditions suggestive of a relatively high ozone to peroxyacetyl nitrate (and/or homologue) ratio. (Author abstract)

05774

Taylor, O. C., Dugger, W. M., Cardiff, E. A., and Darley E. F.

INTERACTION OF LIGHT AND ATMOSPHERIC PHTOCHEMICAL PRODUCTS ("SMOG") WITHIN PLANTS. Nature 192 (4805) 814-6 (Dec. 2, 1961.)

Plant damage due to ozone and peroxyacetyl nitrate (PAN) was studied. Pinto beans and petunia plants were grown under the following light conditions: natural light in the greenhouse, light from cool white fluorescent lamps, light from Sylvania very high output (VHO) fluorescent lamps, and dark chambers. The plants were

exposed to the oxidants for periods of thirty minutes or less and returned to the pre-treatment light condition. Symptoms of oxidant damage were usually aparent within four hours; however, assay of damage was made 48 hours after exposure to the oxidants. Sensitivity to ozone injury was increased by the low light intensity while sensitivity to peroxyacetyl nitrate was increased by the higher light intensity. In one series of experiments, bean plants were fumigated with very high concentrations of PAN for 10 minutes. The plants had been grown under the light and were returned to the light after the 10 minute fumigation. Darkness during this short fumigation period gave complete protection to petunia as well as bean plants, while identical plants, fumigated in the light, were severly damaged. Porometer measurements showed that the resistance to air flow through the stomates during the dark period was essentially unchanged. This indicated that the observed results were related to the interaction of light and some product in the plant and not to the exclusion of PAN by closed stomates.

05777

G. W. Todd E. Propst

CHANGES IN TRANSPIRATION AND PHOTOSYNTHETIC RATES OF VARIOUS LEAVES DURING TREATMENT WITH OZONATED HEXENE OR OZONE GAS. Physiol. Plantarum 16, 57-65, 1963.

Measurements were made on the rates of photosynthesis and transpiration of bean, tomato and coleus leaves during and immediately following fumigation with either ozone or ozonated hexene gas. Both fumigants caused marked decreases in the rate of photosynthesis in all 3 species although in tomato and coleus leaves, the reduction in photosynthesis took place only during fumigation with ozonated hexene gas and afterwards the rate returned to normal. Ozone fumigation caused decreases in transpiration but the decrease was not as large as that obtained for photosynthesis. Transpiration in tomato and coleus leaves showed little response to ozonated hexene gas although bean leaves responded in much the same way as they did when they were treated with ozone alone. The white portions of coleus leaves (where the green outer orrtion had been removed) were used for similar fumigations and an increase in respiration and a decrease in transpiration with ozonated hexene was noted. There were no changes in transpiration from leaves following ozone fumigations. Increases in respiration after ozone and ozonated hexene fumigations were obtained for bean, tomato and intact coleus leaves as had been reported previously for bean leaves. It was postulated that part of the decrease in growth (not accompanied by visible injury) obtained when plants were treated with ozonated hexene gas might be due directly to the reduction in photosynthesis. It would not appear in the species tested that the more resistant species close their stomates and thereby prevent the fumigant from entering. (Author summary) ##

05778

Todd, G. W. and Arnold, W. N.

AN EVALUATION OF METHODS USED TO DETERMINE INJURY TO PLANT LEAVES BY AIR POLLUTANTS. Botan. Gaz. 123, (2) 151-4, Dec. 1961.

An evaluation was made of three methods of analyzing the damage of plant leaves after exposure to ozone or ozonated hexene gas. A visual estimate was made of the amount of leaf surface damaged. The same plants were used for measurements of the change in fresh weight and of chlorophyll content. The latter two measurements were chosen because injury results in desiccation of parts of the leaf and a loss of pigmentation. Also these would be a measure of the actual amount of functional leaf material which was damaged. It was found that losses in fresh weight were nearly proportional to losses of chlorophyll in injured leaves. The visual-rating system appeared to be sensitive in the lower range of injury but rather insensitive at the upper end of the range. The visual-damage index appears to be logarithmic with respect to both chlorophyll and fresh-weight changes. It was concluded that a measurement of the change in either fresh weight or chlorophyll content would give a better estimate of impairment of leaf function, since the visual-damage system tends to overestimate the damage inflicted, particularly when only a small amount of leaf surface is involved. (Author summary)

05851

M. Katz and V. C. Shore

AIR POLLUTION DAMAGE TO VEGETATION. J. Air Pollution Control Assoc. 5 (3), 144-50, 182 (Nov. 1955). (Presented at the 48th Annual Meeting, Air Pollution Control Association, Detroit, Mich., May 22-26, 1955.)

The evidence in the present study on chlorophyll and pheophytin conversion in conifer leaves indicates that acid gases, such as sulfur dioxide in sufficiently high concentration, convert the chlorophyll pigments into the corresponding pheophytins. This process does not take place to an appreciable extent, however, unless the threshold values for sulfite in the living cells is exceeded. The effect may be produced by either relatively short exposures to high concentration of gas or more prolonged exposures to lower concentrations. Transformation of an appreciable proportion of chlorophyll to pheophytin is accompanied by visible symptoms in the tissue, such as plasmolysis, shrinkage of cells, and fading of the normal green color. When these symptoms have progressed to the post-mortem stage, there is of course no chlorophyll or pheophytin left in the injured portions of affected leaf tissue. The color may then turn red or reddish-brown if anthocyanin pigments, associated with the appearance of large amounts of sugar in the cells, are formed. Eventually such leaves turn brown because of post-mortem oxidative changes. These color

changes are characteristic of conifers. In other species, the destruction of the chlorophyll, pheophytin, and other pigments in the chloroplasts results merely in the appearance of bleached or ivory colored areas, as in cereals and alfalfa. In chlorotic injury the affected tissue is deficient in chlorophyll, but the extent of pheophytin conversion is not high, and such leaves may recover their normal functions if plasmolysis has not taken place. Prolonged exposure to sulfur dioxide below the threshold injurious concentration has no appreciable effect on the chlorophyll content of leaves, as shown by sample specimens from the inner and intermediate fume zones of a smelter area. Deposits on leaves and in stomata from smoke and other aerosol contaminants in an urban environment may cause little, if any, discoloration but can result in a reduction in the normal chlorophyll level.##

05902

Richards, B. L., Middleton, J. T. and Hewitt, W. B.

OZONE STIPPLE OF GRAPE LEAF. Calif. Agr. 13 (12), 4, 11 (Dec. 1959).

A study of ozone stipple of grape leaf shows that lesions on the upper leaf surface and premature leaf fall occur on grapevines in areas polluted by airborne ozone. The primary symptoms consist of small, brown to black, discrete, dot-like lesions, which are easily distinguished from the lesions of the other grape disorders because of the stippled appearance on the upper surface of the leaf. The typical primary lesions vary in diameter from about 0.1 to 0.5 mm-millimeter-and are confined to groups of cells bounded by the smallest veins. Large lesions result from coalescence of small ones, and may measure up to 2.0 mm in diameter. Aggregates of these minute spot-like lesions produce the typical stipple appearance.

05903

E. L. Richards, J. T. Middleton, and W. B. Hewitt

AIR POLLUTION WITH RELATION TO AGRONOMIC CROPS: V. OXIDANT STIPPLE OF GRAPE. Agron. J. 50, 559-61 (1958). (Presented at the 50th Anniversary Meeting, American Society of Agronomy, Nov. 20, 1957.)

Small, brown to black, discrete, punctate lesions occur on the upper leaf surface of grape grown in areas polluted by air-borne oxidants. The lesions are typically restricted to the palisade layer and may be easily distinguished from other grape disorders because of their stippled appearance. The disease can be incited in grape by fumigation with ozone. Toxic ozone levels occur in the polluted air mass above the Los Angeles and San Francisco areas where oxidant stipple is found. Stipple has not yet been seen in the grape producing areas in the Coachella, Napa, Sacramento, and San Joaquin valleys of California. Oxidant

stipple can be distinguished from smog-type oxidant injury due to oxidized organics in that the upper leaf surface is stippled in grape and there is no common and pronounced silvering or glazing of the lower leaf surface as found on herbaceous crops and weeds in and adjacent to affected vineyards. Leaf injury to grape due to foliar fluoride accumulation can be readily distinguished because it is marginal red to brown in color, necrotic, and commonly exhibits zonate markings. Stipple can also be easily separated from foliar salinity and drought injury, both of which produce marginal and intercostal leaf necroses similar to those induced by fluorides. Although ozone occasionally may cause leaf injury to some plants particularly grasses, grown in areas receiving naturally polluted air, it is unusual to note ozone damage to agricultural crops; oxidant stipple of grape is, therefore, a unique disease both in its symptomology and etiology.##

06404

D. C. MacLean, D. C. McCune, L. H. Weinstein, R. H. Mandl, G. N. Woodruff

EFFECTS OF ACUTE HYDROGEN FLUORIDE AND NITROGEN DIOXIDE EXPOSURES ON CITRUS AND ORNAMENTAL PLANTS OF CENTRAL FLORIDA. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-158.)

Six citrus varieties and six ornamental species of economic importance to Central Florida were subjected to high concentration-short duration exposures of gaseous hydrogen fluoride (HF) or nitrogen dioxide (NO2). Fose-fumigation observations showed that the effects of acute pollutant exposures differ markedly from those of chronic exposures. HF exposures of 0.5 to 10 ppm and durations of from 30 minutes to 8 hours induced tip, marginal, and intercostal chlorosis and necrosis and abscission of leaves of most plants tested. Injury was most severe on, but not limited to, young leaves. The effect of duration of exposure had a greater influence on abscission of young citrus leaves than did HF concentration. However, the effect of HF concentration on foliar F accumulation could not be separated from exposure time. NO2 concentrations used ranged from 25 to 250 ppm for durations of from 10 minutes to 6 hours. NO2 damage was characterized by rapid tissue collapse, necrosis, and defoliation. Injury was sporadic in appearance, affecting leaves of all ages. The relative contributions of concentration and duration to NO2-induced injury were about equal. (Author abstract)##

06417

I. Ordin, M. A. Hall, M. Katz

PEROXYACETYL NITRATE-INDUCED INHIBITION OF CELL WALL

METABOLISM. J. Air Pollution Control Assoc., 17(12):811-815, Dec. 1967. 11 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 11-16, 1967.)

Levels of PAN which inhibit oat coleoptile section growth reversibly, severely inhibit metabolism of cellulose and of cell wall non-cellulosic polysaccharides. An enzyme in the coleoptile cell walls which hydrolyzes some of the non-cellulosic glucan was partially inactivated by direct PAN treatment of homogenized cell wall. Treatment of intact cells by PAN also resulted in a partially inactivated enzyme. Coleoptile phosphoglucomutase was partially inactivated by treament with PAN both in vitro and in vivo. After treatment of intact cells with PAN, phosphoglucomutase associated with subcellular particles was more severely inactivated than was soluble enzyme. Uridine diphosphate glucose pyrophosphorylase from coleoptiles was inactivated by PAN in vitro but not in vivo. A particulate cellulose synthetase from coleoptiles was inactivated by PAN both in vitro and in vivo. Since cell wall biosynthesis and/or degradation are needed for expansion it is concluded that PAN inhibition of these enzymes may account for reduced cell growth. (Authors' abstract)##

06447

F. A. Wood, D. B. Drummond, R. G. Wilhour, and D. D. Davis

AN EXPOSURE CHAMBER FOR STUDYING THE EFFECTS OF POLLUTANTS ON TREES. Preprint. (Presented at the 63th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-38g.)

In order to study the effects of photochemical air pollutants such as ozone and peroxyacetyl nitrate (PAN) on woody plants, a chamber was selected and modified to provide a uniform concentration of fumigant throughout its interior, a high degree of control of temperature and relative humidity, a size large enough to accomodate five to ten-year old trees and interior components resistant to corrosion by oxidants. This was accomplished by modifying a Model M-2 Reach In Growth Chamber. A preliminary evaluation of temperature, relative humidity, and ozone concentration regimes within the chamber revealed a 1 to 2.0 F fluctuation in temperature, 1 to 2 F fluctuation in wet bulb temperature and a 5% fluctuation in ozone concentration across the chamber. Fluctuations in dry bulb temperature, wet bulb temperature, and ozone concentration at a given point in time were plus or minus 0.5 F-plus or minus 1.2 F, plus or minus 0.5-1.0F, and plus or minus 5% respectively. During fumigations, the system has performed satisfactorily.

06459

Thompson, C. R., J. O. Ivie, and M. D. Thomas

CONTINUOUS RECORDING OF AIR POLLUTANTS AND THEIR EFFECTS ON BEARING CITRUS. Preprint., 1960

Decline in citrus production and fruit quality is reported by growers during the past 15 years in the Los Angeles Basin. Air pollution is considered to be a major factor contributing to this problem. An industry-agriculture-local government-university sponsored, cooperative study entitled the Agricultural Air Research Program was begun in 1960 to assess the economic effect of various air pollutants, principally oxidants and fluorides, on fruit yield, quality and tree growth. Measurements of photosynthesis and transpiration are used to supplement the longtime growth and yield observations. Automatic data recording is provided for: (1) apparent photosynthesis by carbon dioxide exchange: (2) plant transpiration; (3) nitrogen dioxide; (4) nitric oxide: (5) ozone; (6) total oxidants; (7) fluorides; (8) temperatures; (9) integrated sun light recording; (10) date, and (11) time of day. With punch card recording, direct automatic handling of the data on the 1620 IBM computer is possible. The initial experiment is being conducted at Upland, California on 24 lemon trees with six treatments as follows: (1) Clean Air; (2) ambient air; (3) fluoride-free air; (4) ozone-free air; (5) clean air with fluoride added; and (6) fluoride and ozone free air. Four unenclosed trees serve as checks. Plans are underway for similar experiments in other locations with both lemons and oranges. (Authors' summary) ##

06498

L. Ordin, and B. Propst

EFFECT OF PHOTOCHEMICALLY PRODUCED OXIDANTS ON GROWTH OF AVENA COLEOPTILE SECTIONS. Plant Physicl., 36(3), 326-30, (May 1961).

Avena coleoptile sections incubated in solutions through which photochemically produced oxidant mixtures, ozone or peroxyacetyl nitrate (PAN) are passed, display subsequent repressed growth in fresh solutions to which auxin has been supplied. Treatment by oxidant recording as 1.4 ppm derived from an irradiated mixture of trans-2-butene and NO2 results in about 50% inhibition of elongation. About 1.5 ppm PAN also inhibits growth to the same degree or more. Approximately 170 ppm ozone produced comparable magnitudes of inhibition. In all cases basal respiration was inhibited little or not at all. Although the concentrations dealt with here are about tenfold above those found in the atmosphere (200-fold for ozone) the results may be helpful in the interpretation of mechanisms of growth inhibition in the field. There are probably several reasons why high concentrations of PAN are required to produce growth inhibition in Avena coleoptiles while much lower concentrations affect more sensitive intact plants. Although the coleoptile is cutinized and has few stomata, suggesting a transport barrier, there are indications that root tissue which is neither cutinized nor suberized to any great extent may be even less sensitive. Thus the answer is more likely to lie either in the resistance of the cellular membranes

themselves to the uptake of the oxidants or in the presence of reducing agents in the cell or, simply, less sensitive enzyme systems. It was found that intact seedlings in the gas stream are not more sensitive than sections floating in water during gas exposure. The lack of illumination during exposure may also be a factor, since even sensitive petunia plants exposed in the dark to 0.5 ppm oxidant derived from an irradiated mixture were not damaged.**

06500

I. Ordin

EFFECT OF PEROXYACETYL NITRATE ON GROWTH & CELL WALL METABOLISM OF AVENA COLEOPTILE SECTIONS. Plant Physiol. 37 (5), 603-8 (Sept. 1962). (Presented at the Annual Meeting, Western Section American Society of Plant Physiologists, Davis, Calif., June 22, 1961.)

Indoleacetic acid induced growth of Avena coleoptile sections which had been pretreated with 2.4 ppm peroxyacetyl nitrate (PAN) for 6 hours at pH 4 was inhibited 84% during the 4-hour period following fumigation. Production of $C^{14}O_2$ in indoleacetic acid-free, carrier-free glucose solution (ca. 10 to the minus 5th power M) was inhibited about 75% by the pretreatment while total oxygen uptake was unaffected. Incorporation of C^{14} into cellulose and into the acid soluble wall fraction was inhibited 90%. Incorporation into other wall fractions was inhibited to a lesser degree. Under conditions of severe growth inhibition, a marked decline relative to other sugars was found of incorporation of C^{14} into the galacturonic acid of the aqueous soluble wall fractions. A relative decline was also observed in radioactive xylose of the hot water soluble fraction and of the dilute alkali soluble polysaccharide. Possibly the inhibition of growth by PAN is associated with inhibition of metabolism of cellulose. Inhibited metabolism of aqueous-soluble pectin and of acid soluble non-cellulosic polysaccharides may also account for restraint of growth. (Author's summary, modified)**

06557

I. A. Leone, E. Brennan, R. H. Daines

PLANT LIFE AS AIR POLLUTION INDICATORS. Proc. Northeast. Weed Control Conf. 18, 451-5 (1964).

Plants display a particular talent for indicating the presence of very low concentrations of pollutants in the atmosphere. Agricultural people are concerned with two broad groups of pollutants, the primary or single source emissions which are the result of a particular industrial or fuel-utilizing process, and the products of photochemical reactions which are the result of a

whole complex of combustive activities in urban areas. The primary phytotoxic contaminants include hydrogen fluoride, chlorine , sulfur dioxide, ammonia, hydrogen sulfide, ethylene and perhaps illuminating gas. The remarkable thing about these phytotoxicants is that each one severely affects a particular group of plants which is more or less tolerant to the other pollutants. For that reason plant indicators are very useful in diagnosing the specific gas or gases responsible for an air pollution episode, if observed during their optimum growth period.##

07255

Thompson, C. R., O. C. Taylor, M. D. Thomas, and J. O. Ivie

EFFECTS OF AIR POLLUTANTS ON APPARENT PHOTOSYNTHESIS AND WATER USE BY CITRUS TREES. ((Environ. Sci. Technol.,)) 1(8):644-650, Aug. 1967. 20 refs.

Because of the major damage to crops by air pollutants, studies were begun to measure under field conditions, the effect of various atmospheric phytotoxicants on agricultural crops in the Upper Santa Ana Drainage Basin. There was question as to whether photochemical smog and/or fluorides were responsible for major economic losses by the citric industry and if so, how much. Commercially producing lemon and navel orange trees were tested to determine the effects of ambient air pollutants which occur in the Los Angeles basin on water use (transpiration) and apparent photosynthesis. The entire trees were enclosed in plastic covered greenhouses and were supplied various fractions of the atmosphere to find whether ozone, peroxyacyl nitrates, or fluorides were causing deleterious effects. Nitric oxide was added to the air in one treatment to reduce ozone selectively but in so doing, nitrogen dioxide in amounts equal to the ozone was formed. The results showed that the total photochemical smog complex reduced the rate of water use by lemon trees and also reduced the rate of apparent photosynthesis. Fluoride levels occurring in the atmosphere caused no detectable effects. Attempts to evaluate the separate effects of ozone and peroxyacyl nitrates were unsuccessful. Reduction of the ozone in the tree atmospheres by addition of nitric oxide failed to overcome the reduced water use and lowered apparent photosynthesis. (Author abstract modified)##

07453

Seidman, Gabriel and Wilson B. Riggan

STOMATAL MOVEMENTS: A YEARLY RHYTHM. Preprint, Dept. of Agriculture, Cincinnati, Ohio, Crops Research Div. and Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((13)) p., ((1967)). 14 refs.

Since the degree of stomatal opening may influence the amount of air pollutant injury, a year-long study of daytime stomatal movements was initiated. Light, temperature, atmospheric pressure, relative humidity, time of day, and month of year were the parameters studied. Atmospheric pressure was considered because it was felt that air pressure changes might affect the turgor of the guard cells and thus change the size of the stomatal pore. Certified seeds of Phaseolus vulgaris, L., var. Pinto from stock stored at room temperature were planted in a standard peat-perlite mix and grown in the greenhouse and in the growth chamber. Two plants were grown in each 4-inch plastic pot. The pots were placed in a pan of Hoagland's solution. Plants in five pots were started in the greenhouse, and an equal number in the growth chamber each day. In the greenhouse, atmospheric pressure, light intensity, temperature, and relative humidity baried from hour to hour during the day and from month to month during the year. In the growth chamber light intensity, temperature, and photoperiod were held constant. If there were actually daily and yearly rhythms in stomatal opening as a result of photoperiod, temperature, or changes in light intensity only, no rhythms or a reduced rhythm in the growth chamber would be expected. Stomatal movements in plants grown under variable greenhouse conditions as well as under constant growth chamber conditions appear to be subject to seasonal rhythms. Stomates of plants grown during the fall and winter months do not open as wide as those grown during the spring and summer months.##

07455

Tingey, David T. and A. Clyde Hill

THE OCCURRENCE OF PHOTOCHEMICAL PHYTOTOXICANTS IN THE SALT LAKE VALLEY. Preprint, Utah Univ., Salt Lake City, Dept. of Botany, ((13)) p., April 21, 1967. 17 refs.

To determine if photochemical air pollutants were present in Utah along the Wasatch front, ozone sensitive indicator plants (Tobacco Bel-C and W-3) were grown at several locations in Utah, Salt Lake, and the southern part of Davis Counties and observed for injury development. These studies, which were conducted over a seven year period, showed that extensive ozone injury developed on the indicator plants in the northern part of Salt Lake County and the southern part of Davis County. Injury was less severe and developed less frequently in the northern part of Utah County, and injury was extremely rare in the southern part of Utah County. Cursory observations of other species showed that both ozone and PAN injury symptoms occasionally developed. To determine the concentrations of ozone and PAN that are present in the atmosphere, ambient air measurements were undertaken at the University of Utah, Air Pollution Research Laboratory. The authors were particularly interested in PAN measurements because atmospheric PAN concentrations have not been reported in the literature. Results of these analyses are discussed in this paper. A "Mast" ozone analyzer that had been calibrated with potassium iodide was used to measure ozone in the ambient air at the laboratory. Peroxyacetyl nitrate was measured by the method of Darley et al. with

modifications suggested by Stephens. A 9-inch teflon column packed with 5% carbowax 400 on Chromosorb W was maintained at 22 deg in an insulated box cooled with a thermoelectric cooler. An electron capture detector mounted in the box and connected to the electrometer of a Wilkins Model 600 D gas chromatograph was used to determine the PAN concentration. Ozone was measured sporadically during 1965, and starting in June of 1966 continuous measurements have been made except for limited periods when the analyzer was needed for other studies. Two figures are included showing the monthly average ozone concentrations and the average hourly ozone concentrations for representative months. A comparison is also made of the ozone concentrations found in the areas.##

07501

Koukol, Jane and W. M. Dugger, Jr.

SHORT COMMUNICATION: ANTHOCYANIN FORMATION AS A RESPONSE TO OZONE AND SMOG TREATMENT IN RUMEX CRISPUS L. Plant Physiol., 42(7):1023-1024, July 1967. 8 refs.

The red coloration which appears on the leaves of dock plants (Rumex crispus L.) after exposure to smog ro ozone was shown to be due to the appearance of an anthocyanin. The leaves of untreated plants did not contain detectable anthocyanin. Furthermore, chlorosis did occur in treated plants. The anthocyanin was isolated from the leaves of smog treated plants, purified, and identified only as a cyanidin glucoside. (Authors' summary)##

C7610

Freebairn, Hugh T.

THE PREVENTION OF AIR POLLUTION DAMAGE TO PLANTS BY THE USE OF VITAMIN C SPRAYS. J. Air Pollution Control Assoc., 10(4):314-317, Aug. 1960. 14 refs. (Presented at the 52nd Annual Meeting, Air Pollution Control Assoc., Los Angeles, Calif., June 21-26, 1959.)

The amount of protection which vitamin C provided for plants against ozone and smog was investigated. In the laboratory, plants were treated with ascorbate salt by addition to the solution surrounding the roots of plants growing in water culture. The plants were then fumigated with 7-10 ppm of ozone for 2 hours. Poa annua plants growing in a greenhouse were sprayed with 0.04M potassium ascorbate for varying numbers of days before being exposed to polluted air. Similar methods were used on other plants and flowers grown under glass. Lettuce and spinach plants growing commercially were sprayed in the field for one, two and five days per week with potassium ascorbate. Smog attacks occurred about 20 days after spraying was initiated. In these field tests no significant amount of protection was obtained for the spinach;

however, a 66% protection was obtained for the lettuce with a 2 day/week application and an 82% protection with a 5 day/week application. The results of the lab and field tests indicated that vitamin C moved into the leaf cells of some plants and thereby increased the tolerance of the cells to the damaging agents in smog. The protection afforded by vitamin C in the lab from ozone and in the field from air pollutants implied that either ozone was a damaging agent in the field or that vitamin C was effective against other toxic agents in the field.

07786

Hansbrough, J. R.

AIR QUALITY AND FORESTRY. In: Agriculture and the Quality of Our Environment. Brady, N. C. (ed.), Norwood, Mass., Plimpton Press, AAAS-Pub-85, p.45-55, 1967. 25 refs. (Presented at Meeting, American Association for the Advancement of Science, Science, Washington, D. C., DEC. 1966.)

A review which cites examples of injury to forests by specific air pollutants. The source and the nature of the pollutants are discussed. Also, the contribution of trees in combating the air the 133rd. Meeting, American Association for the Advancement of pollution problem is speculated on. As technology changes, trees wherever they grow and for whatever purpose are increasingly subjected to toxic substances in the atmosphere. There is a considerable body of knowledge already available but it is dwarfed by the magnitude of what is not yet known. More information on the nature and source of air pollutants and their present and expected impact on our forest and shade tree resource is necessary.

07864

Krueger, A. P. S. Kotaka, K. Nishizawa, Y. Kogure, M. Takenobu, Takenobu, and P. C. Andriese

AIR ION EFFECTS ON THE GROWTH OF THE SILKWORM (BOMBYX MORI L.). Intern. J. Biometeorol., 10(1):29-38, 1966. 17 refs. CFSTI/DDC: AD 646704

The exposure of silkworm eggs (BOMBYX MORI L.) to unipolar ionized atmospheres of either charge at 24 deg. C and 26 deg. C induced an earlier onset of hatching. Continued treatment of the larvae produced the following physiological effects: (1) A marked increase in the rate of larval growth; (2) Increased biosynthesis of catalase, peroxidase and cytochrome c oxidase; (3) Earlier onset of spinning; (4) A significant increase in weight of cocoon at 24 deg. C and 26 deg. C. At 24 deg. C treatment with either (+) or (-) ions caused a statistically valid increase in pupal weight but at 26 deg. C this occurred only after (+) ion treatment. Exposure at both 24 deg. C and 26 deg. C to air ions of either charge resulted in development of heavier silk layers but the increases were not statistically significant. (Authors) abstract)

08843

Heck, Walter W., John A. Dunning, and Henry Johnson

DESIGN OF A SIMPLE PLANT EXPOSURE CHAMBER. Preprint, Dept. of Agriculture, Cincinnati, Ohio, Agricultural Research Service and Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((28))p., 1967. 3 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 12-16, 1967.

A variety of exposure chamber designs have been used in the study of the effects of phytotoxic air pollutants on vegetation. Acceptability of a design is determined by the types of plants to be studied and the purpose of the research. In any exposure chamber, however, design is determined by the most desirable flow characteristics, the toxicants to be used, and the degree of environmental control desired. A major consideration should be versatility combined with simplicity. The chambers used in studies at the National Center for Air Pollution Control utilize a dynamic, negative-pressure, single-pass flow system with uniformity of flow, toxicant mixing, and distribution in the chamber. The simple design permits easy installation of numerous chambers in a single air-handling system while still permitting individual control of chambers. (Authors' abstract)##

09114

Richards, B. L., Sr., O. C. Taylor, and G. F. Edmunds, Jr.

OZONE NEEDLE MOTTLE OF PINE IN SOUTHERN CALIFORNIA. J. Air Pollution Control Assoc., 18(2):73-77, Feb. 1968.

The specific type of chlorotic mottling in ponderosa pine needles, as reported by various workers, justifies the assumption that X-disease, needle dieback, chlcrotic decline, and ozone needle mottle in various pine species described in this paper are one and the same disease. Experimental production of chlorotic needle mottling in ponderosa pine (Pinus ponderosa Laws) with ozone-polluted ambient air and with synthesized ozone by Miller further justifies this basic assumption. Controlled fumigation studies (1959 and 1960 at the Citrus Research and Agricultural Experiment Station, Riverside, Calif.) confirm needle mottle of pine as a distinctive physiogenic disease, and atmospheric ozone as the prime etiological factor. Basic experimental research together with the wide range of field studies and observations by the present authors have clarified the type and sequence in symptom expression essential for diagnosis, and have greatly extended the range of pine species visibly susceptible to atmospheric ozone. Additional emphasis is placed on significance both of the ozone needle mottle problem and of ozone as an economic factor in forestry. (Authors" abstract)##

09317

E. L. Sharp

ATMOSPHERIC IONS AND GERMINATION OF UREDOSPORES OF PUCCINIA STRIIFORMIS. Science, 3880(156):1359-1360, April 6, 1968. 8 refs.

Atmospheric ions, identified by mobility characteristics, were associated with germination of lyophilized uredospores of Puccinia striiformis West. at Bozeman, Montana. Ions of intermediate size were highest in concentration, and percentage germination of spores was lowest during periods conducive to air pollution. In duplicate experiments at an isolated site near Barrow, Alaska, essentially all atmospheric ions were small ions and the fungus spores were consistently germinated near maximum. (Author's abstract)##

10206

10206I
Haut, H. Van and H. Stratmann

EXPERIMENTAL INVESTIGATION OF THE EFFECT OF NITROGEN DICXIDE ON PLANTS. Transaction of the Land Institute of Pollution Control and Soil Conservation of the Land of North Rhine-Westphalia, Essen. ((Schriftenreihe der Landesanstalt fur Immissions- und Bodennutzungsschutz des Landes Nordrhein-Westfalen, Essen.)) Translated from German. No. 7:50-70, 1968. ((25)) refs.

The effect of NO2 on plants was studied. Because NO is always present wherever there is NO2, NO was also introduced into the exposure chambers containing test plants. Included in the tests were various dicotyledons, monocotyledons, conifers, and deciduous plants. Symptoms of damage included necrosis, chlorosis, striping, and spotting. The toxic tolerances of many plants are listed, along with specific damage symptoms for each. Effects of stage of growth and soil conditions are considered. The concentrations of NO2 which were damaging are compared to the toxic concentrations of SO2 which have been thoroughly studied in the past.##

10426

William A. Feder

REDUCTION IN TOBACCO POLLEN GERMINATION AND TUBE ELONGATION, INDUCED BY LOW LEVELS OF OZONE. Science, 160(3832):1122, June 7, 1968. 1 ref.

In a three part series of tests it was found that pollen of

the ozone-sensitive tobacco variety Bel W-3 undergoes a reduction in germination rate and tube elongation when exposed to ozone. In a first series of tests, pollen was exposed to ozone (1 ppm) for up to 6 hours. Disks were removed from the chamber after exposure of 30, 60, 120, 180, 240, or 360 minutes. In the second series, the pollen was exposed to ozone (0.1 ppm) for 5.5 and 24 hours. A third series consisted of intact flowering plants exposed to ozone (0.1 ppm) for 24 hours in a larger ozonating chamber in which ozone was generated by a Welsbach generator from charcoal-filtered ambient air. Pollen was removed and allowed to germinate. As little as 0.1 part of ozone per million for a 5.5-hour exposure period was sufficient to cause a 40 to 50 percent reduction in germination and a 50 percent reduction in pollen-tube elongation. Ozone caused these effects to approximately the same degree whether the pollen was exposed to ozone in vitro or agar disks, or in vivo when the intact plant is exposed. Exposure to ozone at a concentration of 1.0 part per million for more than 3 hours in vitro completely prevented germination of Bel W-3 pollen. (Author's abstract)##

10674

Heggestad, H. E.

CONSIDERATION OF AIR QUALITY STANDARDS FOR VEGETATION WITH RESPECT TO OZONE. Preprint, Agricultural Research Service, Beltsville, Md., Plant Air Pollution Lab., 11p., 1968. 28 refs. (Presented at the 61st Annual Meeting of the Air Pollution control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-169.)

There is an increasing body of evidence that ozone is the most damaging of all air pollutants affecting vegetation. It is the principal oxidant in the photochemical smog complex. Concentrations measured with an ultraviolet photometer, considered specific for ozone, have exceeded 0.5 part per million (ppm) in the Los Angeles area. Only one-tenth of this level, or 0.05 ppm, for 8 hours is known to injure very sensitive tobacco varieties. Studies in several laboratories show that a broad spectrum of plant species is visibly affected after a few hours' exposure at concentrations much lower than 0.5 ppm. There is also some evidence that ozone reduces plant growth. Many factors must be taken into account in considering standards for possible use in the protection of vegetation from ozone damage. These include ozone concentration and methods of measurement, time of exposure, possible additive effects of other pollutants, sensitivity of species to ozone, their economic value, and the extent of injury which can be tolerated. The response of a species to the pollutants is conditioned by genetic factors and environmental conditions. The lack of routine, specific methods for measuring ozone in ambient air is a handicap. California and Colorado established standards for oxidants at 0.15 ppm and 0.10 ppm, respectively, for 1 hour. How these standards relate to the dosage of ozone that causes acute and chronic injury to various plant species is discussed.##

10690

Miller, Paul R., John R. Parmeter, Jr., Brigitta H. Flick, and Charles W. Martinez

OZONE DOSAGE RESPONSE OF PONDEROSA PINE SEEDLINGS. Preprint, California Univ., Berkeley, Dept. of Plant Pathology, ((18))p., 1968. 18 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-191.)

Fumigation of three-year-old ponderosa pine seedlings in controlled environment chambers with the major oxidant, ozone, at 0.15, 0.30, or 0.45 ppm, 9 hours daily at 25C. and 2500 ft.-c, reduced the apparent photosynthesis rate by 10, 70, and 85% respectively after 30 days exposure. Fumigation with 0.30 ppm ozone for 33 days depressed the cold perchloric acid extracted polysaccharides of both current-and one-year-old needles by 40%. The 80% ethanol soluble sugar concentration of current year, ozone-injured needles increased 16%, and that of the one-year-old needles decreased slightly from the amount present immediately before fumigation. Both sugar and polysaccharide fractions of control plants maintained under identical conditions in carbon-filtered air increased moderately. The increased sugar content of current-year, ozone-injured needles may be associated with a reported increase in the relative participation of this needle age in C1402 fixation after ozone injury. The ascorbic acid content of healthy, current-year needle tissue was nearly half that of older needle tissue. These results emphasize apparent photosynthesis measurements as a sensitive index for assessing the degree of ozone injury to exposed pines, and lead to an interpretation of the etiology of chronic needle abscission of ponderosa pine culminating in death of affected trees.##

10713

Irwin P. Ting, and W. M. Dugger, Jr.

FACTORS AFFECTING OZONE SENSITIVITY AND SUSCEPTIBILITY OF COTTON PLANTS. Preprint, California Univ., Riverside, Dept. of Life Sciences, ((21))p., 1968. 18 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-128.)

The sensitivity of cotton to ozone was studied to ascertain the diurnal time of ozone sensitivity of cotton leaves, the ontogenetic period of susceptibility, and the role of stomatal opening in sensitvity and susceptibility. Cotton plants (Acala SJ-1 and Deltapins smooth leaf) were grown from seed in a greenhouse from July through December, 1967. Five seeds were sown per pot; seedlings were thinned to one per pot. Plants were irrigated with one-quarter strength Hoagland's solution at weekly intervals. Greenhouse conditions with light intensities of 2-4 X 100,000 ergs/sq. cm./

sec, day temperatures as high as 40 degrees C, and minimum night temperatures of 15 degrees, gave plants with fully expanded cotyledons after about 17 to 18 days and a fully expanded first, true leaf after about 20 to 21 days. Plants were brought directly to the laboratory at mid-morning for fumigations with ozone and returned to an environmental control chamber in the laboratory for observation after 24 and 48 hours. During development, successive leaves including cotyledons passed through stages of ozone susceptibility. The precise developmental stage of susceptibility seems to be somewhat before leaves are fully expanded. In general, maximum susceptibility seems to occur at about 75% of full expansion. Fully expanded leaves or very young leaves apparently will not damage even after exposures of 1 ppm ozone for several hours. An important environmental factor correlated with variability seems to be light. Sensitive plants pretreated with dark for 24 hours or more lose their ozone sensitivity. Thus, complete darkness seems to afford some degree of protection. Stomates open after a few minutes exposure to light. In the case of ozone damage, however, plants seem to require several hours pretreatment after a dark period before visible damage would result on susceptible leaves. There was not a positive correlation between leaf resistance (stomatal opening) and visible damage to ozone. There is a peak period of sensitivity of susceptible leaves during mid-morning.##

10965

B.E. Dethier, D.W. Lecher

ATMOSPHERIC POLLUTION BY OXIDANTS AND ITS EFFECT ON VEGETATION IN A RURAL ENVIRONMENT. Trans. N.Y. Acad. Sci., 30(6):863-868, Apr. 1968.

Annual losses to agriculture in the northeastern United States have been previously estimated in excess of 18 million dollars annually. Ozone and peroxyacyl nitrate (PAN) are presently recognized as major oxidants causing plant damage. Investigation of diurnal oxidant levels was initiated at Ithaca, New York, in an attempt to correlate pollution damage to specific plant varieties with recorded oxidant concentrations. Tobacco, variety Bel-W3, which is highly sensitive and fairly specific for ozone, and petunia variety, white cascade, which is very sensitive to PAN and fairly specific for that toxicant, were used in 1967. These plants were grown in carbon-filtered air and were periodically set out in the weather station area. Sensitive seedlings of eastern white pine were also used as indicator plants. Mast ozone meters with SO2 scrubbers and strip charts were used to monitor the ambient ozone concentration. Observations started July 1, 1967, and continued through December 1967. Hourly measurements of total oxidants, temperature, relative humidity, wind direction and velocity, and total incident solar radiation were taken twenty-four hours a day and the data were subject to machine analysis. (Authors' abstract)##

10978

H. W. DeKoning, Z. Jegier

A STUDY OF THE EFFECTS OF OZONE AND SULFUR DIOXIDE ON THE PHOTOSYNTHESIS AND RESPIRATION OF EUGLENA GRACILIS. Atmos. Environ., 2(4):321-326, July 1968

The effects of brief exposures to known quantities of sulfur dioxide and ozone on the photosynthesis and respiration of Euglena gracilis, a unicellular algae grown in a completely synthetic medium were studied. Photosyntheseis and respiration were measured by means of their corresponding oxygen exchanges using a polarographic electrode. Measurements were made with Euglena cells that were suspended in bicarbonate buffer just before exposure and for 24 hr. before exposure. Exposure to either SO2 or SO3 lowers the rate of photosynthesis and increases the rate of respiration.##

11010

Smith, M. E.

THE INFLUENCE OF ATMOSPHERIC DISPERSION ON THE EXPOSURE OF PLANTS TO AIRBORNE POLLUTANTS. Phytopathology, 58(8):1085-1088, Aug. 1968.

Variations in atmospheric dispersion and the typically nonuniform distribution of pollutant sources cause wide fluctuations in pollutant concentrations at a fixed point on the ground. These variations in concentrations are usually correlated with other meteorological parameters, time of day, and the levels of other pollutants. The details of this variability differ strikingly, depending upon the relative location of the plants and the sources and upon the climatology of the area in which the problem exists. An outline of the magnitude and time scales of these fluctuations is presented. Specific correlations with other factors that may be important in designing meaningful dosage tests for pollutants are indicated. Without tests that simulate conditions in the normal atmospheres laboratory experiments will be misleading, and apparent sensitivities may bear little relation to the response of the plant in the field.##

11072

Heck, Walter W.

FACTORS EFFECTING THE RESPONSE OF PLANTS TO OXIDANT AIR POLLUTANTS. Preprint, Dept. of Agriculture, Washington, D. C., Agricultural Research Service and Public Health Service, Washington, D. C., National Air Pollution Control Administration, 9p., ((1968)). 6 refs.

The effects of oxidants in general, including ethylene and NOx on plants are discussed. The problems of chronic plant damage and synergistic effects, such as those discovered for ozone-SO2 mixtures, are considered and are shown to be difficult to detect and evaluate. Projections of ozone concentration producing injury in various plants are presented, and the topics of crop yield reduction and land use are briefly covered.##

11157

Agriculture Research Council, London (England)

THE EFFECTS OF AIR POLLUTION ON PLANTS AND SOIL. 53P., 1967. 202 refs.

An account of recent trends in the emissions and concentrations of smoke, deposited matter and sulphur dioxide in Britain and summarises the information available on the effects of these pollutants on plants and soil is given. The literature on the effects on plants and soil of fluorides and of photochemical, or oxidant, smog which some people think might be troublesome in this country in the future. A note on the contamination of plants near highways with lead from the exhaust fumes of motor vehicles is also included.##

11320

I. Ordin, M.A. Hall, J.I. Kindinger

OXIDANT-INDUCED INHIBITION OF ENZYMES INVOLVED IN CELL WALL POLYSACCHARIDE SYNTHESIS. Preprint, California Univ., Riverside, Dept. of Biochemistry and California Univ., Riverside Statewide Air Pollution Research Center, 12p., 1968. 12 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colorado, July 22-24, 1968, Session V: Biochemical Effects of Air Pollutants, Paper 1.)

The effect of the oxidants, ozone and perocyacetyl nitrate, on the enzymes phosphaglucomatase, UDP glucose pyrophosphorglase and cellulose synthetase was studied. Levels of peroxyacetyl nitrate (PAN) or ozone which inhibit oat coleoptile section growth reversibly, inhibited formation of cellulose and of cell wall non-cellulosic polysaccharides. After treatment of intact cells with PAN phosphoglucomutase associated with subcellular particles was more severely inactivated than was soluble enzyme. A particulate cellulose synthetase from coleoptile was inactivated by either ozone or PAN treatment of oat coleoptiles. It was concluded that oxidant induced inhibition of one or more of these enzymes accounts for reduced polysaccharide synthesis.##

11407

C.B. Thompson, O.C. Taylor

EFFECTS OF AIR POLLUTANTS ON GROWTH, LEAF DROP, FRUIT DROP AND YIELD OF CITRUS TREES. Preprint, California Univ., Riverside, Statewide Air Pollution Research Center, ((31))p., ((1968)). ((17)) refs.

Commercially producing lemon and navel orange trees were studied to determine the effects of the air pollutant complex, especially photochemical oxidants and fluorides, in the Los Angeles Basin on the following responses: growth as shown by increased tree girth and weight of prunings; leaf drop as measured by (a) total weight of dried leaves collected under the trees, and (b) the time which marked leaves remained on randomly selected branches; fruit drop; and yield of mature marketable fruit. The results showed that tree growth measured by increased girth and weight of pruning removed were not affected consistently by the experimental treatments. The rate of leaf drop was significantly less for lemon trees where carbon filtered air was supplied to the trees versus the unfiltered treatments. A similar trend was present in oranges but was not significant statistically. The percent of lemon leaves which remained on selected branches of trees receiving filtered air as compared to unfiltered treatments after 18 months was 72.4 vs. 34.4%. Fruit drop in lemons is of minor significance but in navel oranges represents a serious problem. Comparisons of check trees, unfiltered and carbon filtered air trees showed fruit drop to be 82.5, 59.7, and 39.6, respectively, all percents of which are statistically different at the 1% level. Yield of marketable fruit is also reduced significantly by photochemical oxidants. (Authors' abstract, modified)##

11501

Miller, P. R., J. R. Parmeter, Jr., and B. Flick

THE EFFECTS OF OZONE ON PHOTOSYNTHESIS OF PONDEROSA PINE. Preprint, California Univ., Berkeley, Dept. of Plant Pathology, ((32))p., ((1968)). 28 refs.

The effect of chronic, sublethal ozone fumigations on apparent photosynthesis, chlorophyll loss, the relative participation of different aged needle whorls, Hill reaction rate of isolated chloroplasts and pattern of C14 labeling in the photosynthate of container-grown ponderosa pine were investigated. A depression of the rate of apparent photosynthesis of container-grown ponderosa pine was observed both with and without significant decreases of chlorophyll concentrations following ozone fumigations. Seedlings with two annual complements of adult needles indicated a slight depression of C1402 uptake with a 26 and 24% chlorophyll decrease coupled with a 10% suppression of apparent photosynthesis estimated by infrared CO2 analysis. Comparisons of healthy and ozone injured chloroplasts at a single, saturating light intensity

indicated that the control chloroplasts reduced 0.421 uM DCIP/hr./mg chlorophyll compared to 0.101 for an ozone injured chloroplast suspension with equal chlorophyll concentration. The ozone exposed plant, from which chloroplasts were taken, exhibited a severe chlorotic mottle. One year old and younger needles lost an equivalent amount of chlorophyll, following ozone exposure. However, there was a decided change in the distribution of C14 in the two needle ages. Trees with three and four year's needle retention were fumigated for 40 days. The changes in apparent photosynthesis for ozone damage trees is indicated. It was concluded that the observed depression of apparent photosynthesis was not related to a major change or blockage of the normal pathway of the carbon reduction cycle.##

11581

Menser, H. A. and G. H. Hodges

VARIETAL TOLERANCE OF TOBACCO TO OZONE DOSE RATE. Agron. J., 60(4):349-352, July-August, 1968. 19 refs.

The relative degree of ozone injury to genetically susceptible and resistant tobacco (Nicotiana tabacum L.) plants, was determined. Equal ozone doses derived from three ozone concentrations and nine exposure intervals were imposed on three tobacco varieties in fumigation experiments. Length of exposure determined relative injury at 0.10 ppm, but ozone concentration controlled injury when plants were exposed at 0.20 and 0.30 ppm. Ozone-resistant cv. "Bel-B" sustained less than 10% total injury from a 0.15 ppmhr dose given at any of the three ozone concentrations. A 0.15 ppmhr dose, however, caused significantly greater injury to ozone-susceptible cv. "Bel-W3" at the two higher ozone concentrations. Ozone caused almost 40% leaf injury to Bel-B when plants were exposed to a 0.30 ppmhr dose at 0.20 and 0.30 ppm, but total injury remained near 10% when the 0.30 ppmhr dose was given at 0.10 ppm. Results indicate that varietal response to ozone is controlled by exposure interval and concentration rather than ozone concentration independently. Ozone dose rate affected the size of fleck lesions displayed by Bel-W3. Leaves exposed for 6 hr at 0.10 ppm developed flecks four to six times larger than the flecks obtained after 1 hour at 0.30 ppm.##

11748

Taylor, O. Clifton

EFFECTS OF OXIDANT AIR POLLUTANTS. (Presented at the Symposium on Air Quality Criteria, June 5, 1968.) J. Occupational Med., 10(9):485-499, Sept. 1968. 50 refs.

The interaction of the three major oxidants present in smog (ozone, peroxyacetyl nitrate and NO2) in their effects on plants is discussed and the need for analyzing the effects of combined

and successive exposures to fluctuating concentrations is emphasized. As reported initially by Schuck, high concentrations of hydrocarbons and NO develop during the night, but about 30 minutes after sunrise the NO is almost zero and NO2 has reached a peak; the peroxyacetyl nitrate level increases gradually after sunrise, and the ozone increases sharply as the NO2 drops towards zero. Susceptibility of plants to injury from air pollutants is determined both by the action of stomates (which can exclude injurious levels of some toxic agents) and by internal biochemical or physiological factors. Estimation of economic loss from air pollution is simple when the product is a leafy vegetable, but becomes more difficult in other cases, especially when confused with the effects of insects, drought diseases, (including virus infections) and nutritional factors.##

12034

W. M. Dugger, Jr., and I. P. Ting

THE EFFECT OF PEROXYACETYL NITRATE ON PLANTS. PHOTOREDUCTIVE REACTIONS AND SUSCEPTIBILITY OF BEAN PLANTS TO PAN. Phytopathology, 58(8):1102-1107, Aug. 1968. 31 ref.

The effect of peroxyacetyl nitrate (PAN), a photochemical air pollutant, on plants has been studied by a number of investigators. A brief review of the literature is presented. In this study of the photoreductive reactions and susceptibility of bean plants to PAN, evidence is presented to show that sulfhydryl compounds in bean plants are synthesized in the light. Sulfhydryl content in these plants is a function of plant age, light quality, and photoperiod, strongly correlating with the light-plant-PAN interaction resulting in phytotoxicity. Results are also presented to suggest that the oxidant interaction with plants is a function of the photoreductive process that occurs in plants when in the light. The oxidative characteristics of ozone and PAN are compared with respect to plant damage.##

12042

Heggestad, H. E.

DISEASES OF CROPS AND ORNAMENTAL PLANTS INCITED BY AIR POLLUTANTS. Phytopathology, 58:1089-1097, Aug. 1968. 80 ref.

Air pollution injury to crop and ornamental plants is increasing in the U.S.A. Estimates of annual losses to agriculture from air pollutants, which ranged from $150 to $500 million during the decade 1951-1960, are now $500 million. Although most of the loss is due to growth suppression or chronic injury, it is the acute injury that suggests the nature of the air pollutant and reveals the distribution of the problem. Each pollutant tends to produce its own pattern of injury, leaving graphic records of air pollution

episodes. Photochemical oxidants, ethylene, sulfur dioxide, fluoride, and other pollutants produce marked reactions in various types of plants. The recent developments and current research trends in the assessment of these reactions are reviewed.##

12043

Hepting, G. H.

DISEASES OF FOREST AND TREE CROPS CAUSED BY AIR POLLUTANTS. Phytopathology, 58(8):1098-1101, Aug. 1968. 25 Ref.

Air pollution is one of the increasing and ever-changing environmental stresses to which trees, especially, are exposed. The plant pathologists are developing a body of information which will provide them with the means not only to protect trees from damage due to air pollution but to establish trees as cheap, abundant, selective, and relatively permanent monitors of chronic air pollution of a low level of intensity. Examples of damage caused by identifiable sources are cited. As knowledge increases, foresters and pathologists can apply principles of selective planting which will place automobile fume resistant trees where traffic is heavy, coal or oil fume resistant trees around power plants and steel mills, and fluorine resistant trees around aluminum ore reduction plants and phosphate processing industries.##

12045

Johnson, H.

THE HIGH COST OF FOUL AIR. The Progressive Farmer, 4 pp., April 1968.

The President's Science Advisory Committee reported in 1965 that air pollution damage to plants had been observed in 27 states, the District of Columbia, Canada, and Mexico. Total damage each year to crops in the United States is estimated at $500 million. Weather fleck damage to tobacco, which is caused by ozone, has caused substantial crop loss in all producing states. Sulfur dioxide, fluorine, ethylene, and photochemical smog are known to be harmful to plants. A research program to solve unanswered questions, and a program to enforce the cleaning up of pollution sources is urgently needed.##

12047

de Koning, H. W. and Z. Jegier

QUANTITATIVE RELATION BETWEEN OZONE CONCENTRATION AND REDUCTION OF PHOTOSYNTHESIS OF EUGLENA GRACILIS. Atmos. Environ., 2(6):615-616, Nov. 1968. 5 Ref.

The percentage reduction of photcsynthesis is a logarithmic function of the ozone concentration (0.2-1.0 ppm). Chlorophyll determinations following treatment with 0.8 ppm ozone show a small (5 per cent) loss of chlorophyll b and no loss of chlorophyll a. (Author's Abstract)##

12149

Heagle, Allen S.

EFFECT OF LOW-LEVEL OZONE FUMIGATIONS ON CROWN RUST OF OATS. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 10p., 1969 (?). 9 refs.

Exposure to 10 pphm ozone for 6 hr in the light 10 days after infection significantly reduced the growth of Puccinia coronata uredia on the crown rust differential varieties of Avena sativa. Urediospores produced on the plants that were exposed tc czone germinated as well, produced as many appressoria, and penetrated stomates as well as spores produced on unexposed leaves. Exposure on dry leaves to 20 pphm ozone for 3 hr for 1-5 days did not affect urediospore germinatien, appressoria formation, and penetration. The suppression of the uredium development of the crown dust fungus in this experiment was caused by ozone levels commonly surpassed in many areas, suggesting that the growth of this and possibly other plant parasites is affected by photochemical air pollution. (Author abstract modified)

12155

Leone, Ida A., Eileen Brennan, and B. H. Daines

EFFECTS OF AIR POLLUTION ON VEGETATION. Preprint, Air Pollution Control Association, New York City, 6p., 1962. (Presented at the Air Polltuion Control Association, Mid-Atlantic States Section Meeting, Wilmington, Del., Oct. 26, 1962.)

Phytotoxic pollutants are broadly catergorized as primary or single source emissions and the products of photochemical reactions arising from urban expansion and vehicular traffic. Among the primary contaminants, classified according to their demonstrated order of toxicity to plants, are hydrogen flucride, chlorine, sulfur dicxide, ammonia, and hydrogen sulfide; to these may be added ethylene and perhaps natural illuminating gas. The acute and chronic types of injury caused by SO2, the earliest known offender, and by hydrogen fluoride are described. The latter is the most insidicus of the phytotoxic pollutants, since it is injurious to certain sensitive species at fractions of a part per billion. The two most significant pollutants from photochemical reactions are ozone, which generally attacks the upper leaf surface of sensitive plants, and oxidized hydrocarbons. The chief offender of the oxidized hydrocarbons is peroxyacyl nitrate and its analogues. Plant injury from specific pollutants can be diagnosed by particularly susceptible

species or indicators, by type of symptom, and by significant emission sources in the vicinity. Air quality and meteorological data from three New Jersey communities - Carlstadt, New Brunswick, and Bordentown - are briefly reviewed in relation to phytotoxic episodes. Possibe control measures in combatting pollution damage to plants include anti-oxidant sprays and the breeding of resistant plant varieties.

12166

Frances A. Wood, John B. Coppolino, Donald Davis, David Drummond, and Ray Wilhour

AIR POLLUTION EFFECTS (INTERIM PROGRESS REPORT.) Pennsylvania State Univ., University Park, Center for Air Environment Studies, ((95))p., Jan. 1969. 4 refs.

An exposure system has been constructed out-of-doors which will permit the exposure of several hundred plants simultaneously to low levels of ozone or peroxyacetylnitrate (PAN) for extended periods of time, and a series of plant growth chambers for use in studies of pre- and post-fumigation environmental influences on plant response have been purchased and checked out. Approximately 9,000 seedlings of 34 different tree species have been acquired for exposure purposes and procedures have been developed for handling and maintenance of the plants. Approximately 4,000 seedlings of the 34 species have been exposed to 25 pphm ozone for 8 hours; 16 species were found sensitive. Nine of the species were conifers, seven were hardwoods, and Virginia pine, jack pine, Austrian pine, white ash, green ash, and white oak were among the most sensitive. Symptoms that developed on the 16 species were described in detail. Most of the 16 species were resistant during the first month following bud-break. Plants were sensitive for periods of 6 to 14 weeks during the growing season and they maintained about the same level of sensitivity as age of the current tissue increased. Virginia pine and white ash were selected for intensive studies of the influence of pre-, during, and post-fumigation environmental regimes on plant response to ozone. Preliminary studies indicate that high temperatures and/or high relative humiditie during the pre- and/or post-fumigation periods enhance the development of symptoms on both species.##

12944

Applegate, Howard G. and Lane C. Durrant

SYNERGISTIC ACTION OF OZONE-SULFUR DIOXIDE ON PEANUTS. Environ. Sci. Technol., 3(8):759-760, Aug. 1969. 8 refs.

Peanut plants were fumigated with ozone and sulfur dioxide singly and together. When applied separately, both gases induced characteristic damage to the plants. Ozone-induced injury first occurred on high-moisture plants 24 to 48 hrs after

the start of fumigation. The most mature leaflets turned chlorotic, starting at the middle and progressing toward the margin. Ultimately, while chlorotic but not necrotic, the leaflets abscissed. Sulfur dioxide-induced injury occurred on high-moisture plants 4 to 8 hrs after the start of fumigation. The youngest leaftlets first turned a light tan, and later a darker brown, along the margins. If fumigation continued, the necrosis progressed along the veins into the middle of the leaflet. The entire leaf abscissed when necrosis was complete. A synergistic action not characteristic of individual gases was found when the two gases were administered simultaneously. Four tc five hrs after fumigation, a chlorosis similar in color to ozone injury alone appeared on the youngest leaflets of high-moisture plants. In contrast to the ozone-induced injury, the chlorosis started at the margin and progressed slowly to the midvein. After 46 to 50 hrs, the marginal chlorotic areas turned a light tan similar in color to the sulfur dioxide-induced injury. The necrosis progressed slowly inward and ultimately the leaf abscissed.

13174

POLLUTION DWARFS WHITE PINES. Agri. Res., 18(2):4, Aug. 1969.

Air pollution is currently causing chlorotic dwarf disease in the eastern white pine (Pinus strobus L.), an important lumber source. Dwarfed pines have a sickly, mottled yellow color, are much smaller than normal pines, and eventually die from the disease. Investigations have established the contaminant as either sulfur dioxide, ozone, or an interacting mixture of both gases. Dwarf-susceptible pines developed intense disease symptoms when exposed to mixtures of ozone and SO2, each at a concentration of 6 to 10 pphm. Serious symptoms also developed in susceptible pines exposed to 6 pphm SO2. An Ohio survey reports over 30% of the pines in plantations and in young natural stands have the disease, and some pines were found to be genetically resistant to chlorotic dwarf.

13174

POLLUTION DWARFS WHITE PINES. Agri. Res., 18(2):4, Aug. 1969.

EFFECTS-PLANTS AND LIVESTOCK: Sulfur dioxide, Ozone, White pines, Chlorotic dwarf disease

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when exposed to mixtures of ozone and SO2, each at a concentration of 6 to 10 pphm. Serious symptoms also developed in susceptible pines exposed to 6 pphm SO2. An Ohio survey reports over 30% of the pines in plantations and in young natural stands have the disease, and some pines were found to be genetically resistant to chlorotic dwarf.

14063

Hibben, C. R.

THE DISTINCTION BETWEEN INJURY TO TREE LEAVES BY OZONE AND MESOPHYLL-FEEDING LEAFHOPPERS. Forest Sci., 15(2):154-158, June 1967. 9 refs.

Both mesophyll-feeding leafhoppers and ozone cause white flecks on the leaves of a variety of herbaceous and woody plants, and the superficial similarities between these symptoms can lead to incorrect diagnosis of leaf damage. When contrasted microscopically and histologically on leaves of sugar maples, flowering dogwood, and northern red oak, the phytotoxic effects of both agents were distinguished by differences in location, configuration, color, and size of external injuries and by characteristics of affected palisade parenchyma cells. Predominate ozone symptoms were adaxial flecks 0.1 to 0.5 mm in diameter, consisting of discolored parenchyma cells in the vein islets. Leafhopper-induced injuries were usually 0.25 to 1 mm in diameter, white, and confined to the adaxial surfaces of leaves. They were characterized by fan-shaped sectors intermixed with green tissue. Dogwood was more resistant to O3 than maple and oak. The three species displayed similar internal ozone injuries: protoplast and cell wall collapse of palisade parenchyma cells. Leafhopper feeding produced palisade parenchyma cells devoid of recognizable contents. It is not known whether the same mechanical and/or physiological mechanism governs the sensitivity of the palisade parenchyma cells to two such dissimilar irritants.

14351

Weaver, G. M. and M. O. Jackson

RELATIONSHIP BETWEEN BRONZING IN WHITE BEANS AND PHYTOTOXIC LEVELS OF ATMOSPHERIC OZONE IN ONTARIO. Can. J. Plant Sci. (Ottawa), vol. 48:561-568, Nov. 1968. 13 refs.

Studies on the effects of ozone were conducted in the laboratory and at three field locations in Ontario. Controlled exposure studies indicated that white beans are sensitive to at least 8.4 pphm (parts per hundred million) ozone after 6 hrs of exposure. The array of symptoms include necrotic stipple through disruption of the palisade parenchyma, chlorosis, blanching, and leaf and pod abscission. Leaf maturity also modified sensitivity to ozone. Concentrations of ozone as high

as 9 pphm were detected during mid-August in association with the incidence of the bronzing disorder of white beans in three regions of Ontario in 1965 and 1967. The disorder is characterized by the sudden appearance of a bronze-colored necrotic stipple of pods and the upper surface of the leaf, followed by chlorosis and abscission of both leaves and pods. Conformity between field symptomatology of bronzing and the symptoms arising from controlled treatment with ozone strongly suggests that present levels of ozone in the atmosphere are phytotoxic, predominantly in mid-August, causing widespread damage to white bean plants. The stage of leaf metabolism and differentiation appears to affect ozone sensitivity and, consequently, factors affecting leaf physiology will modify the extent and severity of bronzing. Since the necrotic stipple appears rapidly after ozone exposure, the extent of stipple has diagnostic value in timing these occurrences. However, bronzing continues to debilitate the plants after phytotoxic exposures, because of the progressive chlorosis and abscission of both leaves and pods.

14826

Feder, William A. and Franklin J. Campbell

INFLUENCE OF LOW LEVELS OF OZONE ON FLOWERING OF CARNATIONS. Phytopathology, vol. 58:1038-1039, July 1968. 3 refs.

The effects of the exposure of carnations to low levels of ozone for a prolonged period were investigated in a controlled study. Carnations grown in the presence of ozone at levels below which visible injury usually appears were damaged: an average level of 0.075 ppm for about 10 days depressed bud formation in White Sim carnations if the plants were exposed to the ozone at the time of bud initiation. Exposure periods of eight weeks at these ozone levels were required before tip burn symptoms appeared, whereas such damage was evident only 48 hr after the plants were exposed to oxidant levels of 0.12-0.15 ppm for an 8-hr period. No tip burn occurred in plants grown in filtered air. In addition, plants in the ozone-charged air were bushier and shorter than the control group.

14962

Hill, A. C., M. R. Pack, M. Treshow, R. J. Downs, and L. G. Transtrum

PLANT INJURY INDUCED BY OZONE. Phytopathology, vol. 51:356-363, June 1961. 18 refs.

Phytotoxicity of ozone to 34 plant species was studied in controlled-atmosphere greenhouses. Plants were subjected at various stages of growth to 0.13-0.72 ppm ozone for 2-hour periods. Injury symptoms developed on 28 species. Some of the most

sensitive species were small grains, alfalfa, spinach, and tobacco. There was a general tendency for sensitivity to increase with maturity of tissue. Palisade cells were most readily injured by ozone. On plants with adaxial palisade parenchyma, chlorotic spots and bleached necrotic areas developed on the upper leaf surface. Injury was equally apparent from either leaf surface of plants with undifferentiated mesophyll. Necrotic spots extending completely through the leaf developed on plants with either mesophyll structure when injury was severe. Ozone caused conspicuous tumors to develop on broccoli leaves. Symptoms similar to those produced by ozone fumigations were observed on a wide range of plant species growing near several large metropolitan centers. (Author summary modified)

14963

Menser, H. A., H. E. Heggestad, and O. E. Street

RESPONSE OF PLANTS TO AIR POLLUTANTS. II. EFFECTS OF OZONE CONCENTRATION AND LEAF MATURITY ON INJURY TO NICOTIANA TABACUM. Phytopathology, 53(11):1304-1308, 1963. 21 refs.

The relation of ozone concentration, leaf maturity, and resistance of 4 tobacco varieties was investigated by exposing greenhouse plants to ozone in a carbon-filtered, fumigation chamber. Replicated, 2-hr experiments at 0.10, 0.16, 0.22, and 0.28 ppm ozone showed the 4 varieties exhibited 3 sensitivity levels. Bel-W3, a weather-fleck sensitive selection, was injured at 0.10 ppm, while 0.22 ppm ozone was required to damage the fleck-resistant Bel-B variety. Ozone sensitivity was inversely related to leaf maturity, as determined by rate of leaf expansion. Recently mature leaves were more ozone-sensitive than overmature or rapidly expanding leaves. Ozone lesions were uniformly distributed over the upper surface of recently mature leaves; only tips of expanding leaves were damaged. The maturity-related pattern of injury in some respects resembled Los Angeles smog injury to Nicotiana glutinosa. (Author summary modified)

14966

Menser, H. A., Jr., H. E. Heggestad, and J. J. Grosso

CARBON FILTER PREVENTS OZONE FLECK AND PREMATURE SENESCENCE OF TOBACCO LEAVES. Phytopathology, 56(4):466-467, April 1966. 7 refs.

The purpose of this study was to investigate with a charcoal filter the relation of air pollution to ozone fleck and premature leaf senescence in the eastern USA where ozone concentrations are much lower than those observed in southern California. Two varieties of tobacco plants (Bel-W3 and Bel-B) were grown in identical plastic covered chambers that received either carbon-

filtered or ambient air. Maximum measured ozone concentrations ranged between 2.0 and 8.88 pphm in the ambient air chamber, there was no ozone in the filtered air chamber. Neither ozone fleck nor premature leaf senescence developed on the leaves of plants grown in air passed through the activated charcoal filter. Plants grown in the ambient air displayed both flecking and premature senescence, and the symptoms increased concomitantly. Both Bel-W3 and Bel-B showed similar tendencies toward premature leaf senescence, although displaying different susceptibility thresholds. It is concluded that the leaf senescence observed in the ambient air resulted from initial destruction of tissue by air-polluting ozone rather than from poor moisture conditions or inadequate nutrition, factors commonly associated with leaf senescence.

14968

Daines, Robert H., Eileen Brennan, and Ida Leone

AIR POLLUTANTS AND PLANT RESPONSE. J. Forestry, 65(6):381-384, June 1967. 15 refs.

The effects of a number of acid gases and photochemically-produced pollutants on plants are described. A great variation in susceptibility to damage by such gases as fluorides and SO2 exist both among plant species and within a single species. Injury from these gases occurs primarily to younger leaves, with little or no damage shown by old leaves. Symptoms usually consist of marginal and tip necrosis with accompanying discoloration of the affected areas. Limited studies with chlorine suggest that it is less phytotoxic than hydrofluoric acid, requiring about 0.1 ppm to injure the more sensitive plants. Among the photochemically-produced pollutants, ozone has been known for many years to be toxic to a wide variety of plant species; ozone toxicity symptoms appear as flecks, stipple, streaks, spots, and tip necrosis. Injury appears on mature leaves, with the oldest leaves of young plants and middle-aged leaves of old plants being most susceptible. Peroxyacetylnitrate (PAN) and its analogues are highly phytotoxic, producing symptoms called 'silver leaf' and 'leaf banding' in California, the northeastern U. S., and other urbanized areas. Like ozone, these compounds are believed to cause severe annual economic losses in crop damage. Investigations of damage caused by other photochemical pollutants, namely ozonated hydrocarbons, bisulfite reaction products, and nitrogen dioxide, are briefly summarized, and the major sources of all the pollutants discussed are noted.

15286

Dass, H. C. and G. M. Weaver

MODIFICATION OF OZONE DAMAGE TO PHASEOLUS VULGARIS BY ANTIOXIDANTS, THIOLS AND SULFHYDRYL REAGENTS. Can. J. Plant Sci. (Ottawa), vol. 48:569-574, 1968. 13 refs.

The mechanism of the "bronzing' effect of ozone on white beans (Phaseolus vulgaris), and the degree of protection, if any, offered by various compounds, were investigated. Representative cultivars of white bean were treated with selected antioxidants, thiol compounds, and sulfhydryl reagents and then exposed to ozone under laboratory conditions. Severity of the bronzing disorder was influenced by such treatments, as was the activity of peroxidase and lactic dehydrogenase enzymes. Dust applications of the antioxidants, ascorbic acid and nickel-N-dibutyldithiocarbamate markedly reduced ozone injury, the latter compound being the most effective. Decreased ozone sensitivity was also noted following treatment of a susceptible and a tolerant cultivar with the thiols cysteine hydrochloride and glutathione. The severity of bronzing was increased over that of the control plants by the application of the sulfhydryl reagents parachloromercuribenzoate and N-ethyl maleimide. Necrotic stipple of the upper surface of the lamina, a symptom associated with the bronzing disorder, was induced following treatment with the sulfhydryl reagents without exposure to ozone. Ozone fumigation increased peroxidase activity and decreased lactic dehydrogenase activity. Similar effects were observed following treatment with parachloromercuribenzoate. Neither enzyme showed response to the application of cysteine hydrochloride. The role of protein sulfhydryls is discussed in relation to ozone damage and the bronzing disorder. (Author abstract modified)

15332

Hibben, C. R. and G. Stotzky

EFFECTS OF OZONE ON THE GERMINATION OF FUNGUS SPORES. Can. J. Microbiol., 15(10):1187-1196, Oct. 1969. 37 refs.

To determine whether air pollutants increase plant infection by fungi, an investigation was undertaken of the effects of low concentrations of ozone on the germination of detached conidia, ascospores, and sporangiospores from 14 saprophytic and plant pathogenic fungi. Germination data were calculated for spores on solid media, in liquid culture, and in a dry condition. Detached spores varied in germination after exposure on agar to 10 to 100 pphm ozone for 1 to 6 hrs. Large pigmented spores of Chaetomium sp., Stemphylium sarcinaeforme, S. loti, and Alternaria sp. were insensitive to 100 pphm. Spores of Trichoderma viride, Aspergillus terreus, A. niger, Penicillium egyptiacum, Botrytis allii, and Rhizopus stolonifer were reduced in germination primarily by 50 and 100 pphm for the longer exposures. Small hyaline spores of Fusarium oxysporum, Colletotrichum lagenarium, Verticillium albo-atrum, and V. dahliae were the most sensitive; their germination was prevented or reduced by most exposures to 50 and 100 pphm and occasionally reduced by doses as low as 25 pphm for 4 and 6 hrs. Extended exposures up to 28 hrs reduced germination of A. Terreus, A. niger, and P. egyptiacum spores to below 50% of the controls. Lower doses of ozone sometimes stimulated spore germination. Fungus colonies maintained in an ozone atmosphere had abnormal growth characteristics. Ozone had little inhibitory effect on air-dried spores or spores in a liquid medium. (Author abstract modified)

15382

Kotaka, S., A. P. Krueger, and E. C. Andriese

THE EFFECT OF AIR IONS ON LIGHT-INDUCED SWELLING AND DARK-INDUCED SHRINKING OF ISOLATED CHLOROPLASTS. Intern. J. Biometeorol. (Leiden), 12(2):85-92, 1968. 9 refs.

Experiments were conducted to determine the effects of gaseous ions on isolated spinach chloroplasts maintained in a physiologically active state. Chloroplasts shrink when stored in the dark for 48 hrs at 4 C and swell again when illuminated. The rates of swelling and shrinking, determined by light-scattering techniques, are increased by exposure to both positive and negative air ions. If chloroplasts are preilluminated for 30 min, the rate of shrinking of air-ion-treated chloroplasts is increased. When the chloroplasts are illuminated again, the rate of swelling of air-ion-treated chloroplasts is lower than that of controls. If 2.5 mM of adenosine triphosphate (ATP) is added to the system upon the reillumination, the swelling rate of ion-treated chloroplasts is markedly increased. However, adenosine diphosphate (ADP), p-nitrophenyl phosphate, and inorganic phosphates are without effect. Prolonged illumination (5000 foot candles for 48 hr) or the addition of NaF inhibits the swelling and shrinking phenomenon. Exposure of the chloroplasts in the presence of ATP to unipolar ionized air of either charge at 4 C in the dark increases their swelling and shrinking and ATPase activities. These data suggest that air ions stimulate ATP metabolism of isolated chloroplasts.

15482

Seidman, Gabriel and Wilson B. Riggan

STOMATAL OPENING IN PINTO BEAN DURING DAYLIGHT HOURS. Botan. Gaz., 130(2):116-118, June 1969. 3 refs.

A year-long investigation of daytime stomatal movements of the primary leaves of 11-day-old pinto bean plants was conducted. New plants were used for each bihourly reading. Light, temperature, atmospheric pressure, relative humidity, time of day, and month of year were the parameters studied. Stomatal opening was measured with a modified Alvim porometer on the eleventh day after planting. Atmospheric pressure, light intensity, temperature, and relative humidity varied during the year in the greenhouse, but in the growth chamber, light and temperature were controlled. Of all the variables, only the coefficients for the month of the year and the hour of the day were important in explaining the size variations in stomata of growth chamber plants. After dawn, stomatal opening increases gradually and reaches a peak at noon in the greenhouse and at 2:00 p.m. in the growth chamber. In the greenhouse, the decrease in stomatal opening at 2:00 p.m. was not statistically different from noon, but the decrease in stomatal size at 4:00 p.m. was

statistically different from both noon and 2:00 p.m. In the growth chamber, stomatal opening at 4:00 p.m. was somewhat smaller than at 2:00 p.m., but this difference was not significant. This daily pattern was not explainable in terms of the parameters that were examined in the growth chamber and the greenhouse. Carbon dioxide concentrations, which varied throughout the day, were highest at 8:00 a.m. and lowest at 4:00 p.m. The widest stomatal opening at midday did not correspond to the lowest carbon dioxide concentrations. It was concluded that the findings indicate that endogenous factors probably exert a greater influence on stomatal movement than was demonstrated.

15492

Feder, William A., Franklin J. Campbell, and Norman W. Butterfield

TIP BURN, AN OXIDANT INCITED RESPONSE OF CARNATIONS. Plant Disease Reptr., 51(9):793, Sept. 1967.

Leaf tip burn was observed on greenhouse carnations in Massachusetts and occurred only on the younger leaf tips of young plants. The tips were killed and turned a straw brown color. Symptoms extended from a few mm to 2-3 cm back from the tips and were set off from the rest of the leaf by a sharp margin; tissue below the burned tip was healthy. Damage was restricted to the affected tips and persisted while the rest of the plant continued to grow normally. Microscopic examination of the dead leaf tips revealed no pathogens. The incidence of carnation tip burn occurred within 24-48 hrs after a 3-day period during which a high level of oxidant was recorded in the Waltham, Mass. area. Levels during this period exceeded 10 pphm for 4 hrs and averaged over 6 pphm for the 72-hr period. Carnations growing in air pollution study chambers in charcoal-filtered air were free of tip burn, whereas those grown in chambers receiving unfiltered air had a high incidence of tip burn. The evidence points to some airborne toxicant as the apparent cause of tip burn. The high oxidant level recorded just before the damage seemed to implicate ozone as one possible cause of carnation tip burn. However, the damage may actually be caused by a mixture of toxicants including ozone.

15514

Taylor, O. Clifton

IMPORTANCE OF PEROXYACETYL NITRATE (PAN) AS A PHYTOTOXIC AIR POLLUTANT. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1968. 25 refs. (Presented at the Air Pollution Control Assoc., Annual Meeting, 61st, Saint Paul, Minnesota, June 1968, Paper 68-168.)

Peroxyacyl nitrates are a family of compounds resulting from

photochemical reactions between contaminants released to the atmosphere by combustion of organic fuels. Peroxyacetyl nitrate (PAN) is the most abundant member of this family and is responsible for serious plant injury in some polluted areas. Plant injury has been recognized in at least 19 states and several foreign countries, but economic loss causes greatest concern in California, where levels of the toxicant frequently exceed those required to produce plant injury. Characteristically, injury from PAN appears as glazing or bronzing of the lower leaf surface, but the symptom syndrome also includes tissue collapse, chlorosis, and leaf drop. PAN inhibits activity of several enzyme systems by attacking the sulfhydryl group when enzyme extracts are fumigated in vitro. PAN can produce visible symptoms when sensitive plants are exposed for 4 hours to about 14 ppb. Other members of the family (peroxypropionyl nitrate, peroxybutrye nitrate, and peroxybenzoyl nitrate) are more toxic than PAN. Concentrations of 20 to 30 ppb PAN are common in Riverside, California, where a maximum peak of 58 ppb was measured for one 2-hour period. Peaks as high as 54 ppb in Salt Lake City and 210 ppb in Los Angeles, have been reported. Peroxyacyl nitrates are also important eye irritants in atmospheres contaminated by effluents from organic combustion.

15535

Price, Harvey Edward

THE EFFECT OF OZONE ON LIPID PRODUCTION IN THE FUNGUS HELMINTHOSPORIUM SATIVUM. Utah Univ., Salt Lake City, Dept. of Botany, Thesis(MS), May 1968. 23p., 8 refs.

Lipid production in the fungus Helminthosporium sativum was studied in relation to the presence of intracellular globules observed in ozone-treated cultures. Cultures fumigated at concentrations above 35 pphm for 144 hrs exhibited a significant decrease in lipid content following exposure, an increase in radial growth size and wet weight, and alterations in mycelial growth patterns above the agar surface. No changes were evident in the fatty acid composition of the lipid extracts, indicating that ozone suppresses lipid synthesis. The decrease in lipid production suggests that the globules observed in the hyphal tips of ozone-treated mycelia do not contain neutral lipid substances. The presence of the globules in the hyphal tips is more likely to be associated with ozone-induced damage than the production of vacuolar lipid material. It is hoped that further investigations at lower ozone concentrations of the alterations in mycelial cell growth will reveal the threshold limit below which aerial growth will develop. Additional work at lower concentrations is also needed to obtain correlations between growth stimulation, lipid synthesis, aerial growth, and cell damage.

15559

Heck, Walter W.

FACTORS INFLUENCING EXPRESSION OF OXIDANT DAMAGE TO PLANTS.
Ann. Rev. Phytopathol., vol. 6:165-188, 1968. 101 refs.

The sensitivity of plants to oxidants, conditioned by a number of external factors to which the plants are exposed, was reviewed. Research supports the thesis that the stomatal apparatus must be open before the phytotoxicant can enter the sensitive mesophyll areas of the leaf and cause damage. There is both direct and indirect evidence to support the view that the stomata are only a pathway for the entrance of the pollutant, and not the primary mechanism controlling injury. It was suggested that the mechanism which controls resistance of plants to oxidant pollutants may be similar to the one which controls resistance to other extremes in the environment. Plants are more sensitive when grown under a short photo period and at low fertility levels. A long dark period prior to exposure increases sensitivity. Plants grown under low light intensities are more sensitive to ozone and less sensitive to peroxyacetyl nitrate (PAN). Low temperatures for one to several days prior to exposure or growth under drought conditions reduce sensitivity. Sensitivity at time of exposure increases with increasing light intensity and humidity. Sensitivity of plants exposed under natural conditions is affected more by light intensity than by temperature. High carbon dioxide levels at the time of exposure reduce sensitivity. Plants exposed under any soil conditions that produce a water stress in the plant show an increased resistance. Injury from PAN is mediated by a light-sensitive system within the plant. Sulfur dioxide acts synergistically with both ozone and nitrogen dioxide on sensitive plant tissues. The presence of pathogens may also affect sensitivity as well as a slight change in the micro-environment of a leaf. Plant sensitivity increases during mid-day exposure; it is also affected by maturity. (Author summary modified)

15578

Ordin, L. and T. L. Teng

PEROXYACETYL NITRATE INDUCED INHIBITION OF GREEN PEA STEM GROWTH.
Preprint, California Univ., Riverside, Dept. of Biochemistry and Statewide Air Pollution Research Center, 11p., 1968(?).
8 refs.

Preliminary data are reported for the effect of peroxyacetyl nitrate (PAN) on growth and cell wall metabolism in stems from nine-day old peas. Gassing of intact plants in light with 2.4 ppm PAN for 11 hours inhibited stem growth by 32%. Decapitated plants showed 45% inhibition of growth but decapitated plants treated simultaneously with 1% idoleacetic acid (IAA) and 1% gibberellic acid (GA) showed only 15% inhibition. However, damage to residual leaves was seen even on the hormone treated plants. Treatment of plants with 5.4 ppm PAN in darkness produced neither leaf damage nor inhibition of growth. Plant sections treated with 2.7 ppm PAN adsorbed and respired added glucose at control plant rates or slightly more rapidly, but cell wall metabolism was inhibited. Excised sections exposed to 23 ppm PAN

in darkness or in light grew less than controls when subsequently placed in KC1 growth solutions. Added IAA reduced growth inhibition in these excised sections. The data suggest that intact plant stems do not absorb enough PAN in darkness for their metabolism or growth to be affected at levels affecting them in light. The mechanism by which excised sections absorb PAN in darkness presumably does not involve light. The inhibition of intact stem growth in the light might be due to an insufficiency of auxin and/or nutrients leading in turn to inactivation of growth-maintaining enzymes or to the formation of inhibitory products from auxin which after transport react with the enzymes. The role of endogenous auxin remains to be investigated.

16096

Dodd, N. J. F. and M. Ebert

FREE RADICAL REACTIONS MODIFY CELLULAR DAMAGE. Nature, 221(5187): 1245-1246, March 29, 1969. 8 refs.

The properties of molecular species which are responsible for cell death in spores after irradiation were studied. Radical groups were recognized by their response to nitric oxide and oxygen and titrated with these gases using both physical and biological endpoints. Doses for ESR observations were 500 krad and those for survival experiments varied from 1-10 krad given at 200 krad/min and 3 krad/min respectively. ESR signals were ascribed to five different radical groups. Groups I, II, and III were observed within 10 min of irradiation in N2, C2, and NO. In N2, group I decays. In O2, group I, II and possible III decay, while group IV grows at the expense of the others. In NO, all but the resistant group V decay. Group V radicals are recognized only after decay of the other groups. The inactivation constant for anoxic irradiation was increased by O2 post-treatment giving full oxygen enhancement. In corresponding ESR experiments this treatment initiates the formation of radical group IV and reduces total radical population. Group I is not involved in the formation of IV, but may be responsible for anoxic damage. Group IV is correlated with the oxygen enhancement and may contain peroxy radicals. Post-treatment with NO only removes the potential for oxygen enhancement. Corresponding ESR experiments suggest that NO prevent further biological damage by removing radical groups I, II, and III. Although NO removes group IV, it does not reduce the damage already caused by O2. NO and O2 interact faster with the potential for oxygen enhancement during irradiation than in post-irradiation treatment. Rates measured by ESR were slower than those found biologically. This suggests that the groups are heterogeneous. The radicals of biological importance in groups I and II react faster with O2 and NO than those of lesser importance. Evidence showed that the potential for oxygen enhancement does not reside only in initially produced species but can be handed onto daughter species. Radical group IV species responsible for oxygen enhancement, whereas group I includes those responsible for irreversible damage produced in anoxic conditions.

16244

Thomas, Moyer D.

AIR POLLUTION WITH RELATION TO AGRONOMIC CROPS: I. GENERAL STATUS OF RESEARCH ON THE EFFECTS OF AIR POLLUTION ON PLANTS. Agron. J., vol. 50:545-550, 1958. 39 refs.

Plant damage caused by sulfur dioxide, fluorine compounds, and smog is summarized. Sulfur dioxide causes two types of leaf injury: acute and chronic. The acute markings are marginal or interveinal collapse areas; their color is usually ivory. The chronic markings are areas of limited cell injury but not total collapse; the colors range from yellow to brownish-red to white and represent fumigation treatments or prolonged exposure to low concentrations. No reduction in yields have been demonstrated in plants exposed to sulfur dioxide unless there was leaf injury. The fluoride pollution problem as two aspects: direct injury to commercial and ornamental plants and the risk of fluorosis in cattle and sheep exposed to contaminated vegetation. Hydrogen fluoride and silicon tetrafluoride are extremely toxic to a few plant species. Hydrogen fluoride in ppb concentrations cause lesions resembling those due to sulfur dioxide. Photosynthesis experiments, the results of which are presented in tables and graphs, indicate that each crop has its own threshold limit which varies from 5 ppb for gladiolus to about 500 ppb for cotton. Smog damage to vegation is of two kinds: that produced by London coal smoke or fog containing sulfur dioxide; and Los Angeles smog, which is a mixture or oxidants. California smog injury tends to appear as a band on a leaf. Owing to the presence of organic compounds, ozone damage is rarely found in the field. The question remains open whether leaf damage from London fog is due to sulfur dioxide or to other toxicants.

16273

MacKnight, Martha L.

THE EFFECT OF OZONE ON STOMATAL APERTURE AND TRANSPIRATION. Utah Univ., Salt Lake City, Dept. of Botany, Thesis (MA), June 1968, 80p. 153 refs.

The effects of ozone on stomatal movement and transpiration were investigated. Several species of plants were fumigated with ozone, and stomatal aperatures were measured from leaf surface impressions. Attached trifoliate leaves of Pinto beans were enclosed in a small leaf chamber and were fumigated with ozone. The transpiration rate of the enclosed leaf was measured by determining the difference in the relative humidity of the air before entering, and after leaving, the leaf chamber. Ozone was observed to cause stomatal closure and the degree of closure varied with the different plant species. Since the degree of stomatal closure for a given species varied inversely with the amount of damage which subsequently appeared on the leaves, such ozone-induced stomatal closure may afford the plant some measure of

protection from damage by reducing further entrance of the toxicant into the leaves. A 30-minute fumigation with 20-40 pphm ozone caused a decrease in the transpiration rate of Pinto bean leaves. Such a decrease in transpiration was inevitably followed by the appearance of visible leaf damage. The age of the trifoliate leaves was the most important factor in determining whether an ozone-induced decrease in transpirate rate would be observed for a given leaf. Young (3-8 days) and old (31-46 days) leaves showed no transpiration decrease in response to ozone, whereas the medium aged (19-24 days) leaves invariably displayed such a decrease. The extent of the reduction in transpiration rate was dependent upon ozone concentration, the season of the year, and the intensity of light prior to fumigation. The time of fumigation during the day, the initial transpiration rate, the soil moisture, and the presence of artificial lighting during growth, seemed to have no effect on the extent of the transpiration decrease. The amount of visible damage appearing on the leaf was related to light intensity during and after fumigation, ozone concentrations, and the season of the year. Leaf temperature was observed to be inversely related to the transpiration rate. (Author abstract modified)

16287

Tomlinson, Harley and Saul Rich

THE OZONE RESISTANCE OF LEAVES AS RELATED TO THEIR SULFHYDRYL AND ADENOSINE TRIPHOSPHATE CONTENT. Phytopathology, vol. 58:808-810, June 1968. 12 refs.

Experiments assessing the importance of sulfhydryl groups and adenosine triphosphate in the ozone sensitivity of leaves are reported. Ozonation lowered the sulfhydryl content of the leaves of beans, spinach, and tobacco. Tobacco and bean leaves treated with sulfhydryl-binding reagents, such as alpha-iodoacetamide and alpha-iodoacetic acid, developed symptoms similar to those produced by ozone. A tobacco variety resistant to ozone was also more resistant to damage from sulfhydryl-binding reagents than was a variety of tobacco susceptible to ozone. With leaves from the same tobacco plant, the older the leaf, the more severely it was damaged by the sulfhydryl-binding reagents. This parallels the pattern of susceptibility to ozone. Ozonation also lowered the ATP content of bean leaves. Bean leaves were made resistant to ozone by allowing them to take up 0.001 M ATP through their petioles before ozonation. On tobacco, the younger, more ozone-resistant leaves had higher concentrations of both sulfhydryl groups and ATP than did the older, more ozone-susceptible leaves. However, leaves of a tobacco variety resistant to ozone contained lower concentrations of both sulfhydryl groups and ATP than did comparable leaves of a tobacco variety susceptible to ozone. (Author abstract modified)

16311

Brennan, Eileen and Ida A. Leone

SUPPRESSION OF OZONE TOXICITY SYMPTOMS IN VIRUS-INFECTED

TOBACCO. Phytopathology, 50(2):263-264, Feb. 1969. 12 refs.

Virus-free tobacco plants and those infected with tobacco mosaic virus were exposed to ozone fumigations in an environmental chamber. The objective was to compare the response of normal and virus-infected foliage of tobacco with toxic concentrations of ozone. Twelve nicotiana sylvestris plants, at the 6 to 8-leaf stage, were inoculated with tobacco mosaic virus (TMV), and 12 were maintained as noninoculated controls. Both virus-infected and virus-free plants were then exposed to 0.30 ppm ozone in a fumigation chamber for 3-6 hours. On the day following exposure to ozone, typical symptoms of ozone toxicity always developed on the virus-free plants, but never on those infected with TMV. Shorter time exposure showed less extensive damage to the healthy plants, but again with no apparent damage to plants infected with TMV. Exposure of the virus-free tobacco plants caused visible injury that was accompanied by certain biochemical changes that were not observed in virus-infected plants. An increase in respiration and nitrogen content and a decrease in carbohydrate content of the foliage was observed. The mechanism of protection of virus-infected plants provide against ozone is unknown. The presence of the virus apparently hastens the maturation of the tobacco plants. Other means that increase the physiological age of the leaves may also offer protection.

16312

Tomlinson, Harley and Saul Rich

RELATING LIPID CONTENT AND FATTY ACID SYNTHESIS TO OZONE INJURY OF TOBACCO LEAVES. Phytopathology, 59(9):1284-1286, Sept. 1969. 10 refs.

Evidence is presented that fatty acid content may be a factor in determining ozone resistance, and that fatty acid content decreases in leaves exposed to ozone. Leaves of Nicotiana tabacum were made more resistant to ozone injury by brushing emulsions of lanolin, desylsuccinic acid, methyl palmitate, palmitic acid, oleic acid, or cottonseed oil onto the adaxial surface. Effects of ozone on plants were produced by exposing them to 1 ppm for one-half to 1 hour. At the concentrations used, these materials neither occluded nor caused abnormal movements of the stomata. There was little difference in the total lipid content of leaves from tobacco plants which were normally ozone resistant or ozone susceptible. However, there were significant differences in their fatty acid content. Among plants of the same variety or from genetically similar varieties, fatty acid content was correlated with ozone resistance. Tobacco leaves exposed to ozone lost 60% of their saturated fatty acids, but only 10% of their unsaturated fatty acids. (Author abstract modified)

16313

Treshow, Michael, Frances M. Harner, H. E. Price, and J. P. Kormelink

EFFECTS OF OZONE ON GROWTH, LIPID METABOLISM, AND SPORULATION OF FUNGI. Phytopathology, 59(9):1223-1225, Sept. 1969. 14 refs.

The possible effects of ozone on mycelial growth, spore production, spore germination, and lipid metabolism were determined. Fumigations with ozone at concentrations of 10 pphm or more for 4 hr repeated daily for 4 days suppressed radial growth and spore production of Colletotrichum lindemuthianum, the most sensitive species studied. Neither radial nor mass growth of Alternaria oleraceae, a more tolerant species, was inhibited by 60 pphm ozone, although spore production was significantly accelerated. Since ozone did not affect spore viability, the inoculum potential was greatly enhanced. Histological effects of ozone included loss of pigmentation in C. lindemuthianum and abundant formation of light-refractive globules in the hyphae. Chemical analyses of mycelial mats showed an average 28% decrease in neutral lipid content of ozone-fumigated cultures. No differences were detectable in fatty acid composition of fumigated cultures. While some lipids may have leaked into the substrate, it was suspected that ozone penetrated into vital sites within the cell-oxidizing sulfhydryl groups, thereby suppressing lipid synthesis. The actual degree of suppression in fumigated hyphae may be greater than indicated, since much of the mycelia analyzed grew within the substrate and was not directly subject to ozone. (Author abstract modified)

16354

Costonis, A. C. and W. A. Sinclair

RELATIONSHIPS OF ATMOSPHERIC OZONE TO NEEDLE BLIGHT OF EASTERN WHITE PINE. Phytopathology, 59(11):1566-1574, Nov. 1969. 25 refs.

A common needle blight of eastern white pine was found in field and laboratory studies to be a syndrome of acute and chronic ozone injury. Natural occurrences of acute symptoms on susceptible field and potted trees were often related to specific prior increases in ambient ozone concentration. Detection of this relationship required needle elongation, so that new loci of injury could be distinguished from older ones. Ozone, administered at time-concentration combinations monitored in the atmosphere of a rural pipe stand (3 pphm for 48 hr to 7 pphm for 4 hr), caused acute injury to current-season needles on field and potted trees. When sensitive trees were fumigated in a polyethylene chamber in constant mist and sunlight (about 1.32 cal/cu cm per min) at 32-38 C, they were consistently more severely injured than when fumigated with the same concentration of ozone without mist under a variety of other environmental conditions. New needles of sensitive field and potted trees remained nonsymptomatic when confined in polyethylene bags or when grown in charcoal-filtered air. Acute symptoms of ozone injury on sensitive needles of the current season arise as silver flecks caused by collapse of individual mesophyll cells beneath the stomatal surfaces of the needles. These may coalesce to form yellow to pink spots, necrotic bands, and tip necrosis. Chronic symptoms are chlorosis

and premature casting of the older foliage and slow growth of trees. Individual trees vary greatly in susceptibility to ozone injury. Susceptible trees are more sensitive during a 6- to 8-week summer period when needles of the current season are elongating. (Author abstract modified)

16357

Otto, Harry W. and Robert H. Daines

GENESIS OF PHYTOTOXIC AIR POLLUTANTS AND THEIR IDENTIFICATION AND MEASUREMENT BY CHEMICAL AND PHYTOLOGICAL METHODS. IEEE (Inst. Elec. Electron. Engrs.) Trans. Geosic, Electron., GE-8(1):59-69, Jan. 1970. 105 refs. (Presented at the First Annual International Geoscience Electronics Symposium, Washington, D. C., April 1969.)

Phototoxic air pollutants derived from combustion of fossil fuels and from subsequent photochemical reactions in the atmosphere are discussed. Among the major pollutants that adversely affect vegetation are sulfur dioxide, ozone, peroxyacyl nitrate (PAN) and analogs, nitrogen oxides, and ethylene. The chemical methods currently employed to measure the occurrence of these pollutants frequently lack specificity and sensitivity to specific pollutants. In the absence of collaborative testing, their reliability, precision, and accuracy remain uncertain. Because the plant kingdom serves as a constant atmospheric monitor, the chemical methods should be supplemented by a study of plant response. Each pollutant has its own spectrum of responding plant species and each produces a characteristic response for each species affected. While man-made monitoring devices record exact chemical concentrations unaffected by environmental factors and pollutant mixtures, a plant responds biologically not only to concentrations, but also to all other environmental factors that alter response, i.e., humidity, soil moisture, light, temperature, etc. In addition, the plant also responds to the total impact of the pollution mixture.

16360

Brown, Leland R. and Clark O. Eads

FACTORS AFFECTING THE APPEARANCE OF HOLLY OAKS IN SOUTHERN CALIFORNIA. J. Econ. Entomol., 62(1):114-117, Feb. 1969. 5 refs.

The causes of the poor appearance of mature holly oaks, Quercus ilex L, planted along parkways in San Marino, were investigated. Tree foliage was sparse, and there also appeared to be a necrosis and drooping of the small developing shoots. The new terminal growth was associated with the presence of a leafhopper. Six hydraulic sprays of oxydemetonmethyl gave the best control of a leafhopper, as compared to mist sprays of oxydemetonmethyl or hydraulic sprays of DDT. No treatment yielded control of a necrotic tip dieback that was attributed to the leafhopper. Dead trees were felled and examined. Complete girdling by white fan-

shaped mycelial plaques under the root bark and on the root bark, black shoestring rhizomorphs of the oak root fungus Armillaria mellea, were observed. Hot, dry weather, and the possible interaction of smog, also had very obvious effects o the appearance of the trees. Follcwing a smog alert, the trees had an cbvious reddish-brown hue added to their overall dark green appearance. It was not possible tc correlate the appearance of the trees with the irrigation practices of the property cwner but the soil under the tree was dry and dusty. The most important interacting factors contributing to the decline of the oaks, and their death in some cases, was fcund to be, in probable order of importance, root rot infection; inadequate irrigation; hct, dry, smoggy weather; and the necrotic dieback.

16362

Hibben, Craig R.

OZONE TOXICITY TO SUGAR MAPLE. Phytopathology, 59(10):1423-1428, Cct. 1969. 36 refs.

Sugar maples exposed to ozone under laboratory and field conditions were less sensitive to ozone than Pinto bean seedlings. The threshold level for visible injury to maple foliageafter short exposures was 20 to 30 pphm for 2 hr. Extended intermittent doses as low as 10 pphm at 2 hr/day fcr 14 days caused slight injury. Trees treated in the field were injured by ozone only slightly less than potted trees treated under artificial conditions, but understory saplings in the shade were not injured by a high dose. There was great tree-to-tree variability in sensitivity. Ozone caused disruption and collapse of palisade parenchyma cells and adaxial flecks in the vein islet tissue; bifacial scorch developed following exposure to higher doses. Immature leaves were not injured by high doses. Ozone caused leaf abscission only after severe injury by the higher doses. It sometimes induced chlorosis on field trees but never caused twig dieback. Total lipids in some ozone-injured cells were reduced, but no gross changes in the lignin, cellulose, pectic, or starch constituents of the cells were detected. There was no evidence of natural ozone damage to trees when the external and histologic symptoms induced experimentally were compared with those observed on sugar maples growing in urban and roadside environments. It was concluded that ozone is not an important causal factor in the etiolcgy of sugar maple dieback. (Author abstract modified)

16517

Tingey, David Thomas

FOLIAR ABSORPTION OF NITROGEN DICXIDE. Utah Univ., Salt Lake City, Dept. of Botany, Thesis (MA), June 1968, 46p. 50 refs.

The uptake rate of nitrogen dioxide and its effects on photosynthesis, transpiration, and stomatal closure in alfalfa

and oats were studied. Factors affecting the absorption rate, such as concentration of NO2, duration of exposure, light and darkness, were evaluated. The results showed that alfalfa and oats absorbed NO2 from the air in excess of 150 microliters NO2/sq m ground area/min when exposed to 24 pphm NO2. Nitrogen dioxide uptake by alfalfa and oats decreased with time when the plants were exposed to 16 and 24 pphm NO2, but remained constant when the plants were exposed to 8 pphm NO2. In artificial light, the absorption rate of NO2 decreased when artificial light intensity was decreased; but when sunlight intensity was reduced, there was no effect on NO2 absorption. Nitrogen dioxide absorption by alfalfa in the dark was 40 microliters NO2/sq m ground area/min when exposed to 16 pphm NO2 with a gradual increase in the uptake. Oats exposed to 16 pphm NO2 in the dark showed an erratic uptake behavior with no evident trend. Nitrogen dioxide assimilation showed a correlation to light intensity, probably because light intensity influenced stomatal behavior. Carbon dioxide assimilation and transpiration exhibited similar responses. Nitrogen dioxide absorption data indicated that plants under proper conditions should be able to remove a significant portion of NO2 from the air. The concentrations required to cause visible damage to alfalfa was NO2 with 200 pphm in the dark and 400 pphm in the light. Oats required 600 pphm in the light and 800 pphm in the dark. When oats and alfalfa were exposed to 8,16, and 24 pphm NO2 for 4 hours, there was no reduction in photosynthetic rate or transpiration. These same concentrations did not induce stomatal closure. (Author abstract modified)

16617

Dost, Frank N., D. J. Reed, and C. H. Wang

INORGANIC FLUORIDE PROPELLANT OXIDIZERS. VOLUME II. EFFECTS UPON MICROORGANISMS, FISH, AND PLANTS. Oregon State Univ., Corvallis, Science Research Inst., Contract AF 33(615)-1767, Proj. 6302, Task 630204, AMRL-TR-187 (vol II), 59p., Nov. 1968. 7 refs.
CFSTI, DDC: AD 684176

The effects of the inorganic fluoride oxidizing agents (chlorine trifluoride, chlorine pentafluoride, bromine pentafluoride, oxygen difluoride, nitrogen trifluoride, and tetrafluorohydrazine) upon selected species of microorganisms, fish, and plants were studied. Interhalogens were directly injected into water in a closed vessel to provide a reaction mixture. The biological activity of accidentally released chemical agents cannot be studied without considering their reactions with soil, the atmosphere, and the aqueous phase of the environment. Whether gaseous intoxicants can contact biological species resident in aquatic media or soil depends on the probabilities of dispersion of any given gas and for its affinity for and/or reactivity with the physical substrate. Each of the compounds studied is a candidate oxidizer for missile propulsion. In acute exposure of less than 1 hour, the interhalogens, as gases, were destructive to plants at atmospheric concentrations of 10-30 ppm; in aqueous solution, they were lethal to fish and microorganisms at concentrations of 10-25 micrograms fluoride per milliliter. The latter effects resulted from formation of inorganic acids and various oxidizing species, either

of which is lethal alone and which can be neutralized by basic compounds and reducing agents and by filtration through soil. Oxygen difluoride was toxic to plants at concentrations in air as low as 1.5 ppm over a 30-min exposure period but had no effect upon aquatic species. Nitrogen trifluoride and tetrafluorohydrazine are nearly innocuous to nonmammalian organisms. (Author abstract modified)

16704

Brennan, Eileen and Ida A. Leone

SUPPRESSION OF OZONE TOXICITY SYMPTOMS IN VIRUS-INFECTED TOBACCO. Phytopathology, 59(2):263-264, Feb. 1969. 12 refs.

Virus-free tobacco plants and those infected with tobacco mosaic virus were exposed to ozone fumigations in an environmental chamber. A comparison of the effects of the ozone revealed that virus-free plants showed marked necrosis after exposure, while infected plants exposed under the same conditions showed no necrosis. In some tests run during the summer months, both virus-free and virus-infected plants were equally damaged on exposure to ozone. At present the mechanism of protection that virus-infected plants provide against ozone is not known. The presence of the virus apparently hastens the maturation of the tobacco plants. However, high N content or biochemical changes induced by the virus may account for the resistance of infected tissue to ozone damage.

16906

Russell, C.

EFFECT OF NITRIC OXIDE AND HYDROGEN SULPHIDE ON RADIATION SENSITIVITY OF SPORES OF BACILLUS MEGATERIUM IN SUSPENSION. Experientia, 22(2):80-81, Feb. 1966. 9 refs.

The effect of nitric oxide and hydrogen sulfide on the radiation sensitivity of wet spores in a buffered suspension was determined. There was a slight sensitization by NO when present during irradiation at a concentration of 0.5% NO in N2. Above that concentration, the sensitivity of B. megaterium spores decreased, being below that in N2 when 100% NO was used. Sensitivity was much lower when irradiation took place in H2S. The enhancement of sensitivity due to pretreatment with NO required a minimum of 12 hours contact with the gas. Four observations showed that the surviving fraction after irradiation in N2 was unaltered by subsequent contact with 100% NO for 30 minutes. It was concluded that the effects of NO on wet spores was qualitatively similar to that found with a suspension of vegetative bacteria. The far greater protection shown by H2S may be a reflection of damage inflicted by NO upon the metabolism of the cell, making it more radiation sensitive.

16950

Dugger, W. M.

RESEARCH INVESTIGATING INTERACTION BETWEEN ATMOSPHERIC OXIDANTS AND LIGHT IN PLANT SYSTEMS. Preprint, 8p., 1968 (?). 20 refs.

Research is proposed for continuing studies on the effect of peroxyacetyl nitrate (PAN) on the photosynthetic mechanism and the components of the Electron Transport System by using a dual wave band spectrophotometer. Earlier research on the effect of the quality of light in PAN damage to plants showed that red light (660 millimicrons) can induce damage response in bean plants while far red light (700 millimicrons) induces protection. Sulfhydryl (SH) compounds in bean plants are synthesized in the light; a strong correlation exists between the effect of plant age, light quality, and photoperiod on SH content on susceptibility of the plants to PAN damage. Also under investigation is the inhibitory effect of PAN on cyclic photophosphorylation by chloroplasts from Black Valentine bean leaves; inhibition in either the dark or the light increases linearly as the PAN is increased, but complete inhibition does not occur in the light; the ligh inhibition requires more PAN than does the dark. In addition to a continuation of the physiclogical studies on the SH content of bean plants, research is being started to describe the changes at the molecular level responsible for the change in the SH content of bean plants, particularly the increase due to light. Other topics under investigation are the effects of oxidants, especially ozone, on anthocyanin biosynthesis, and permeability and carbohydrate metabolism changes induced by ozone.

16974

Certli, J. J.

EFFECT OF SALINITY ON SUSCEPTIBILITY OF SUNFLOWER PLANTS TO SMOG. Soil Sci., 87(5):249-251, 1958. 10 refs.

Experiments which demonstrate a relationship between salinity of nutrient medium and susceptibility of sunflower plants to smog are reported. The materials and the methods are described. The effect of smog on leaves of sunflower plants which were growing in solutions of different salinities or at different moisture tension is illustrated. The most severe injury occurred on recently matured leaves; young leaves at the growing points resisted smog. The damage was concentrated more on the apical parts on young leaves, while on slightly older leaves, the large central areas were injured; on even older leaves, the heaviest damage was observed on the basal parts. The injury on opposite leaves was strikingly symmetrical. Both salinity and high moisture tension increased the resistance of sunflower plants to smog injury. Plants grown in a 1-strength Hoagland solution frequently showed more than 50% of the leaf areas chlorotic or

necrotic; in an 8-strength solution, there was no visible damage. Such results were obtained consistently during every smog period. Similar patterns of injury resulted when the plants were exposed to sulfur dioxide or the oxides of nitrogen.

17038

Koeppe, David E. and Raymond J. Miller

LEAD EFFECTS ON CORN MITOCHONDRIAL RESPIRATION. Science, 167(3923):1376-1378, March 1970. 7 refs.

Oxidation of exogenous nicotinamide adenine dinucleotide and succinate by corn mitochondria was measured as a function of lead chloride concentration. Concentrations of 50-60 micromoles/l stimulated oxidation of exogenous reduced nicotinamide adenine dinucleotide by 174-640%, depending on the reaction medium; concentrations of 12.5 micromoles/l inhibited succinate oxidation by more than 80%. When inorganic phosphate was included in reaction mediums, the subsequent addition of lead was without effect due to the low solubility of lead phosphate. The addition of lead followed by the addition of phosphate released the inhibition of succinate oxidation by lead but did not decrease the stimulation of oxidation of reduced nicotinamide-adenine dinculeotide by lead. It is significant that the effects of lead seen in the study were observed at very low concentrations and that there was a sharp increase in the magnitude of its influence within a small range of concentrations. When effective concentrations of lead are reached in the atmosphere, there could be a dramatic reduction in plant growth under conditions of phosphate deficiency. (Author abstract modified)

17057

Heck, Walter W. and Allen S. Heagle

MEASUREMENT OF PHOTOCHEMICAL AIR POLLUTION WITH A SENSITIVE MONITORING PLANT. J. Air Pollution Control Assoc., 20(2):97-99, Feb. 1970. 8 refs.

The highly susceptible tobacco variety Bel-W3 was used to determine the distribution, frequency of occurence, and levels of photochemical oxidant in rural areas within 5 to 75 miles of Cincinnati. A comparison of weekly or seasonal indices of plant damage, compiled by adding the percentage injury of each leaf with weekly oxidant indices, determined from oxidant levels recorded in a laboratory, showed no consistent relationship between weekly oxidant concentrations and weekly plant injury during the summers 1966 through 1968. Observations revealed almost daily injury to the plants, fairly uniform total seasonal injury at all locations, and marked variation in both oxidant and injury from one season to another. The phytotoxic oxidants potential at sites 75 miles from Cincinnati suggest pollution sources other than Cincinnati for the sites. It is possible that all of Southweastern Ohio is affected by phytotoxic air pollution.

17093

Stolzy, L. H., C. C. Taylor, J. Letey, and T. E. Szuszkiewicz

INFLUENCE OF SOIL-OXYGEN DIFFUSION RATES ON SUSCEPTIBILITY OF TOMATO PLANTS TO AIR-BORNE OXIDANTS. Soil Sci., 91(3):151-155, March 1961. 9 refs. (Paper No. 1254, University of California Citrus Experiment Station, Riverside, California.)

A study was undertaken to determine whether oxygen conditions in the soil-root environment influence plant susceptibility to damage by air-borne oxidants. The materials and methods used are described. The tomato plants subjected to the two low-oxygen treatments could be visually separated from the plants in the higher oxygen treatments the day after the oxygen treatments were applied. The plants in the low partial-pressure treatments had thick, dark green leaves; during afternoons, progressively more wilting was observed. Plants growing in the 10-mm. Hg. treatments appeared to be almost normal in growth in comparison to the control plants. In the 0-10-mm treatments, no new rootlets appeared along the plexiglass bottom during the 80-hour period. In the remaining treatments, the number of rootlets approximately doubled during this period. Maximum damage after fumigation by peroxyacetyl nitrate (PAN) or ozone always occurred on the most recently matured leaves. In cases of severe damage on recently matured leaves, there was always some damage to the apical parts of the young leaves, with no apparent damage to older mature leaves. Tissue damage was the main damage from fumigations with both PAN and ozone in the high oxygen treatments. Silvering and glazing were characteristic of leaf damage at a low level of ozone fumigation. Soil oxygen diffusion rates taken in field plots show that limited oxygen supply to plants could affect the susceptibility of plants to air-borne oxidant damage under field conditions.

17097

Taylor, Gordon S. and Saul Rich

ANTIOZONANT-TREATED CLOTH PROTECTS TOBACCO FROM FLECK. Science, vol. 135:928, 1962. 2 refs.

Laboratory experiments protecting tobacco plants from ozone damage by the use of cloth treated with antiozonants were described. Tests showed that tobacco is protected by enclosing groups of plants completely in tents of cloth treated with 4,4'-dioctyl diphenylamine in butyl latex. The treated cloth also reduces the amount of fleck on adjacent, open plants. Spraying the antiozonant on the walls of a previously untreated tent prevents subsequent flecking of plants within the tent. (Author abstract modified)

17109

MacLean, David C., Delbert C. McCune, Leonard H. Weinstein, Richard H. Mandl, and George N. Woodruff

EFFECTS OF ACUTE HYDROGEN FLUORIDE AND NITROGEN DIOXIDE EXPOSURES ON CITRUS AND ORNAMENTAL PLANTS OF CENTRAL FLORIDA. Environ. Sci. Technol., 2(6):444-449, June 1968. 11 refs.

Six citrus varieties and six ornamental species of economic importance to central Florida were subjected to high concentration-short duration exposures of gaseous hydrogen fluoride or nitrogen dioxide. Postfumigation observations showed that the effects of acute pollutant exposures differed markedly from those of chronic exposures. Hydrogen fluoride exposures of 0.5 to 10 ppm for periods of from 0.5 to 8 hours induced tip, marginal, and intercostal chlorosis and necrosis, and abscission of leaves of most plants tested. Symptoms were most severe on, but not limited to, young leaves. The effect of duration of exposure had a greater influence on abscission of young citrus leaves than did HF concentration. However, the effect of HF concentration on foliar F accumulation could not be separated from exposure time. The NO2 concentrations used ranged from 25 to 250 ppm for periods of from 10 minutes to 8 hours. Nitrogen dioxide damage was characterized by rapid tissue collapse, necrosis, and defoliation. Symptoms were sporadic in appearance, affecting leaves of all ages. The relative contributions of concentration and duration to NO2 induced injury were about equal. (Author abstract modified)

17210

Kotaka, Sadao and Albert P. Krueger

STUDIES ON THE AIR-ION-INDUCED GROWTH INCREASE IN HIGHER PLANTS. In: Advancing Frontiers of Plant Sciences. Lokesh Chandra (ed.), vol. 20, New Delhi (India), Impex India, 1968, p. 115-208. 57 refs.

Preliminary studies were conducted on the effect of gaseous ions on higher plant growth. The influence of ionized oxygen and carbon dioxide on the growth of barley and the influence of reduced-ion-air on the growth of Hordeum vulgaris was determined. Exposures of oat, barley, lettuce, pea, and maize seedlings to unipolar ionized atmospheres of either negative or positive charge produced statistically significant growth stimulation. The extent of growth increase was related to atmospheric ion density. Analytical data showed that no significant alterations in composition developed in the ion-treated oat or barley. Moderate densitites of O2(-) and O2(+) (18,000 ions/ml) in air containing an added 8% O2 accelerated the growth rate under laboratory conditions. Approximately the same number of CO2(-) and CO2(+) ions in air containing 8% CO2 inhibited growth, impeded the production of chlorophyll, and devitalized young seedlings. Studies were

also conducted on the biochemical mechanisms of air-ion-induced growth increase in higher plants. Experiments included air ion effects on free and bound IAA, studies on air-ion-enhanced preparation of iron-chlorotic seedlings, and air ion effects on iron incorporation into early germinating seeds. Equilibrium between free and bound IAA in barley was not displaced by exposure to air ions. Hordeum vulgaris seedlings grown in a chemically defined iron-free nutrient solution developed iron chlorosis. When the growth took place in unipolar ionized atmospheres of either charge, the onset of chlorosis was accelerated and accompanied by the appearance of large amounts of cytochrome c. When the seedlings were grown in a substrate containing iron and were exposed to ionized air, they did not develop chlorosis but exhibited the typical ion-induced increase in growth rate and an increased production of cytochrome c. Air ions enhanced incorporation of iron into early germinating barley seeds. The synthetic mechanism of the iron-containing enzymes and heme in air-ion-treated plants is being investigated.

17227

Dochinger, L. S., F. W. Bender, F. L. Fox, and W. W. Heck

CHLOROTIC DWARF OF EASTERN WHITE PINE CAUSED BY AN OZONE AND SULPHUR DIOXIDE INTERACTION. Nature, 225(5231):476, Jan. 31, 1970. 6 refs.

The interaction of ozone and sulfur dioxide causes characteristic symptoms of chlorotic dwarf disease on susceptible eastern white pine (Pinus strobus L.). Sensitive and resistant white pine ramets were exposed to 10 pphm of sulfur dioxide, 10 pphm of ozone, or to mixtures of the two (each in a concentration of 10 pphm). The pines were fumigated for 4-8 hr each day, five days a week, for 4-8 weeks. Symptoms were not observed on any resistant ramets or sensitive control plants. Chlorotic dwarf symptoms of flecking, occasionally accompanied by a shedding of older needles, were noted on most sensitive exposed plants. There was little or no injury to plants treated with one of the gases and moderate injury in those treated with the gaseous mixture. The percentage of mottling on current needles and the premature drop of older needles exposed to the mixture far exceeded the damage to those treated with one gas. This strongly suggests that the two pollutants act synergistically on sensitive white pine plants.

18041

Taylor, O. C.

IMPORTANCE OF PEROXYACETYL NITRATE (PAN) AS A PHYTOTOXIC AIR POLLUTANT. J. Air Pollution Control Assoc., 19(5):347-351, May 1969. 25 refs.

Peroxyacyl nitrates are a family of compounds which result from

photochemical reactions between contaminants released to the atmosphere by combustion of organic fuels. Peroxyacetyl nitrate (PAN) is the most abundant member of this family and is responsible for serious injury in some polluted areas. Plant injury has been recognized in at least 19 states and several foreign countries but economic loss has caused greatest concern in California. Characteristically, injury from PAN appears as glazing or bronzing of the lower leaf surface but the symptom syndrome may also include tissue collapse, chlorosis, and leaf drop. PAN inhibits activity of several enzyme systems by attacking the sulfhydryl group when enzyme extracts are fumigated in vitro. PAN may produce visible symptoms when sensitive plants are exposed for 4 hours to about 14 ppb. Other chemical members of the family are more toxic than PAN. Concentrations of 20 to 30 ppb PAN occur frequently at Riverside, California, and a maximum peak of 58 ppb was measured for one 2-hour period. Peaks as high as 54 ppb were reported at Salt Lake City, and 210 ppb at Los Angeles, California. (Author's Abstract)

06499

L. Ordin and B. Propst

EFFECT OF AIR-BORNE OXIDANTS ON BIOLOGICAL ACTIVITY OF INDOLEACETIC ACID. Botan. Gaz. 123(3), 170-5 (Mar. 1962).

This investigation concerns the effects of some of the known atmospheric pollutants, namely ozone, peroxyacetyl nitrate (PAN), and ultraviolet-irradiated mixtures of olefin and NO2 on indolacetic acid in vitro. It is apparent from the results that air-borne oxidants such as PAN and ozone can inactivate IAA in vitro. Whether such a mechanism of inactivation is of importance in the living plant cannot be answered fully at present. Ascorbic acid prevented the inactivation of IAA by chemically reducing the oxidant level in the solutions. The residual ascorbate, or its decomposition products, in the growth solutions exerted a slight subsequent inhibitory action on coleoptile growth. This observation does not agree with the results of other investigators. Since the concentration of ascorbate was much higher in the present experiments than that used by other investigators, it is possible that the growth-stimulating range was exceeded in the present investigation. The failure of IAA activity to recover despite low residual amounts of PAN or ozone in solution and, more particularly, despite the addition of ascorbate to the previously treated solutions indicates that the inactivation is not similar to that caused by H202 or peroxides. In the peroxide-induced inactivation, there is an apparent interference with the bioassay rather than an irreversible change. In the case of inactivation by ozone or PAN the change is irreversible as shown by the changes in ultraviolet spectra. Some light on this irreversible inactivation is shed by the ultraviolet spectra. They show that the change in IAA caused by ozone and PAN is probably a ring alteration.##

H. EFFECTS – MATERIALS

00115

B. L. Ajax, C. J. Conlee, and J. B. Upham

THE EFFECTS OF AIR POLLUTION ON DYED FABRICS. J. Air Pollution Control Assoc. 17,(4) 220-4, April 1967.

This report details results from the first 6 months of a 2-year study begun in February 1965 by The American Association of Textile Chemists and Colorists and the Public Health Service to evaluate the effects of air pollution upon dyed fabrics. Groups of 69 dye-fabric combinations representing widely used dyes have been exposed in light-free cabinets to ambient environments at urban and rural sites at Chicago, Washington, D.C., Tacoma, and Los Angeles, and at urban sites at Cincinnati, Phoenix, and Sarasota. Results from consecutive 3-month seasonal exposures and controlled-environment exposures utilizing irradiated and nonirradiated automobile exhaust for short duration show an extreme fading on one quarter of the dyed-fabrics, a higher fading at urban compared with rural sites on susceptible fabrics, and a marked effect upon the dyed fabrics by the photochemical by-products of automobile exhaust. (Author abstract)##

02270

C. H. Giles

THE FADING OF COLOURING MATTERS. J. Appl. Chem. (London) 15, 541-50, Dec. 1965. (Presented at the Second International Conference, International Inst. for Conservation (I.C.C.), Delft, Netherlands, July 7, 1964.)

This paper describes most of the influences which affect the permanence of colouring matters, yet in making practical suggestions for prolonging the life of museum specimens little can be added to the recommendations made by Russell & Abney 77 years ago. If the specimens are coloured with organic colouring matters, store them in a dry, clean, acid-free and oxygen-free atmosphere, and allow them to be illuminated in the weakest acceptable light, without ultraviolet radiation, for the shortest practicable time. (Author conclusion)##

02941

V. S. Salvin

EFFECT OF AIR POLLUTANTS ON DYED FABRICS. J. Air Pollution Control Assoc. 13, (9) 416-22, Sept. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-84.)

The fading of dyes through chemical reaction with atmospheric contaminants has been responsible for complaints from air pollution areas. Oxides of nitrogen and ozone are contaminants which have beeen established as reactants. Sulfur dioxide is the source of absorbed acid which can accelerate the reactions. The fading of dyes by ozone takes place in air pollution and in rural areas. The contribution of air pollution to increased ozone and oxidant concentrations is demonstrated in service exposure fadings. Sunlight fastness results are shown to require consideration of simultaneous change due to atmospheric contaminants. Exposure to irradiated auto exhaust gases under controlled conditions gives fading results which are equivalent to service exposures in Los Angeles.##

04320

Jaffe, L. S.

THE EFFECTS OF PHOTOCHEMICAL OXIDANTS ON MATERIALS. J. Air Pollution Control Assoc. 17(6):375-378, June 1967.

The deterioration of materials exposed to photochemical smog, in particular to the oxidants and ozone contained therein, are revieved. One of the earliest indications of photochemical oxidants was the excessive cracking of rubber products. It has been demonstrated that this excessive cracking of rubber is caused by ozone formed in the photochemical smog formation process. Other materials known to deteriorate under atmospheric photochemical smog conditions are textiles and certain dyed fabrics, particularly under conditions of high humidity. Loss of tensile strength of cotton textiles when wet or moist, and similar fading of these dyed fabrics, particularly under high humidity, can be produced by laboratory exposure of these textiles to pure ozone. Depending on the formulation of the rubber, cracking under stress can be readily detected within 3/4 hr when atmospheric oxidants levels are as low as 0.03 ppm. Natural and certain synthetic rubbers are particularly vulnerable. These rubbers when stressed show cracking when exposed to 0.02 ppm ozone for about 1 hr. Ozone effects on asphaltic materials are reported also. AAM##

05233

P. J. Hearst

VOLATILE PHOTODEGRADATION PRODUCTS OF ORGANIC COATINGS. Naval Civil Engineering Lab., Port Hueneme, Calif. July 1966. 36 pp. (Technical Rept. (No. R 460.)

Various clear and pigmented vehicle films were irradiated in air with a mercury arc and a xenon arc. The volatile photodegradation products were identified by infrared spectroscopy. The coatings included alkyd, oil, vinyl-alkyd, vinyl copolymer, partially hydrolyzed vinyl copolymer, polyvinyl acetate, epoxy-amine, and epoxy-polyamide films. The major product from all films was carbon dioxide. Eleven other products or types of products were obtained, as well as some unidentified products. The addition of pigments decreased the yields of almost all the products. However, the yields of different products were affected in different degrees by pigmentation, and this difference may in part be related to the penetration of the light responsible for the production of each particular product. (Author abstract)

09041

Salvin, V. S.

RELATION OF ATMOSPHERIC CONTAMINANTS AND OZONE TO LIGHTFASTNESS. Am. Dyestuff Reptr., Vol. 54, p. 33-41, Jan. 6, 1964. 28 refs. (Presented at the American Association of Textile Chemists and Colorists Convention, Boston, Mass., Nov. 1, 1963.)

The effect of atmospheric contaminants-oxides of nitrogen, sulfur dioxide and ozone-in causing dye fading, is shown for various dyes on cotton, rayon, nylon, acetate, polyester, acrylics and wool. Data is presented on three-month exposures protected from sunlight in Los Angeles, California, an area of high NO2 low SO2 and high ozone; Chicago, Illinois, moderate NO2, high SO2 and low ozone; Phoenix, Arizona, a sunlight testing station of moderate ozone, tract NO2 or SO2, but low humidity; and Sarasota, Florida, a sunlight testing station of moderate ozone, trace NO2 or SO2, but high humidity. The potential contribution of atmospheric contaminants as a variable in the lightfastness testing is shown in a series of dyes exposed simultaneously in presence and absence of sunlight. The experimental results are used to explain certain variations in lightfastness results obtained by the AATCC in exposures at constant number of Langleys, equivalent temperatures and humidity but in different localities. The phenomena of ozone fading are discussed from the standpoint of occurrence, vulnerable dyes, chemical reaction, and effect of humidity. Exposure to irradiated auto exhaust gases in a laboratory chamber representing a combination of NO2 and ozone duplicates the Los Angeles exposure results. The investigations have led to three recommendations in AATCC test procedures which should give truer correlation between service results and accelerated test methods:

A) a test procedure for ozone fading; B) the use of higher humidities in testing of dyes on cotton, rayon and nylon to ozone and to oxides of nitrogen fading; and C) a proviso in the outdoor lightfastness test methods that changes due to atmospheric fading be noted. (Author's abstract)##

I. EFFECTS – ECONOMIC

09313

THE RISING COSTS. Mach. Des., 39(17):23-24, July 20, 1967.

Damage from air pollution both direct and indirect has been estimated at 65 dollars per person per year, or 11 billion dollars annually. Agricultural losses are estimated at 325 million dollars annually. A single day of smog in California a few years ago reportedly ruined an entire lettuce crop. On the eastern seaboard, pollution is said to destroy 18 million dollars of crops each year. Atmospheric corrosion from sulfuric-acid mist has been reported to do about 6 million dollars damage per year in New York City alone. The costs of control, although a small percentate of the 11 billion dollars total, are also significant. The petroleum industry is reported to spend 18 million dollars annually on air pollution control out of a total capital outlay of 350 million dollars. The major steel manufacturers in the Chicago area entered into a 8-yr agreement with the local regulatory agency to prevent some 88,000 tons of dust annually from entering the atmosphere. The estimated total cost of the program is 50 million dollars. Research efforts into better detection and control seem pitifully small in comparison to the total damage estimate. Federal Government research allocations will approach 18 million dollars in 1968. The anticipated expenditures at the Federal level to achieve goals in reduction of pollutant levels and in establishing air quality criteria are estimated at 130 million dollars over the next several years.

10985

M. Meckler

COST ESTIMATING. AIR HANDLING EQUIPMENT FOR CONTAMINATION CONTROL. Air Conditioning, Heating, Ventilating 65(7):37-40, July 1968.

Cost-capacity relationships can be used to help select the optimum mechanical system during preliminary budget studies. The steps in this factoring process are defined and some examples of their applications are presented.##

11815

Garet, Ronald, Richard Drapkin, and Andrew Schaeffer

THE ECONOMIC EFFECT OF OZONE ON HOME MAINTENANCE COSTS IN THE LOS ANGELES BASIN. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 223-254, 1968. 14 refs.

EFFECTS-ECONOMIC: Ozone, Economic losses, Home maintenance

The effect of ozone on home and car maintenance costs in the Los Angeles Basin was researched by mailing 10,000 surveys to residents of Glendale in Southern California and Mountain View in Northern California. The goal was to determine the percentage frequencies with which residents of a city with little ozone repaired and replaced common household items, fan belts, and automobile tires as compared to those frequencies in a community with high ozone concentration. Preliminary analysis of 2400 returns show definite differences between Glendale and Mountain View, due probably in part or whole to ozone. The differences range from a few to several hundred percent. They indicate that the cost of air pollution to individuals in the Los Angeles Basin greatly exceeds the sixty dollars per year estimate of the California State Air Resources Board.

12170

Parrish, E. M.

EFFECTS OF AIR POLLUTION PROPERTY DAMAGE AND VISIBILITY. Preprint, Duquesne Light Co., Pittsburgh, Pa., 12p., 1963. (Presented at the Pennsylvania Air Pollution Control Inst., Pennsylvania State Univ., University Park, Pa., Sept. 9-13, 1963.)

EFFECTS-ECONOMIC: Materials deterioration, Visibility, Economic losses

The cost of air pollution in the continental U. S. is in excess of six billion dollars a year. This is the cost of permitting and tolerating air pollution--not the cost of abatement, enforcement, research, or personal suffering. Six billion is the loss in property or property values and the increased burden of maintenance and premature replacement. The following is a possible breakdown of the different classes of material that fall prey to air pollution: masonry - stones, concrete, brick; metals in all forms - structural, equipment, hardware; decorative and protective coatings; vegetation; textiles, rubber, plastics, leather, paper, insulation; property values, art, sculpture, architecture, historical artifacts. Visibility reduction is also a result of air pollution. These eight topics are briefly discussed to show the manner in which air pollution effects each one.

14584

Norton, S. G.

USE OF SULPHATE TURPENTINE AS A CHEMICAL RAW MATERIAL. TAPPI, 120(7):66, Feb. 1945. (Presented at the Byproducts Committee of the Technical Assoc. of the Pulp and Paper Industry, Savannah, Ga., Oct. 18-19, 1944.)

EFFECTS-ECONOMIC: Solvents, By-product recovery, Sulfates

The alpha and beta pinenes that are derived from the crude sulfate turpentine obtained as a by-product from the sulfate process can be used in the production of many new commercial synthetics. Reactions involved in the creation of these materials include isomerization, hydration, dehydration, esterification,, etherification, oxidation, and polymerization. Examples of commercially produced pinene synthetics are isecticides, solvents, pine oil, cough remedies, perfume bases, and placticizers. Many other products are awaiting introduction; all indicate an unlimited market for crude sulfate turpentine as long as its price remains stable and moderate.

J. AIR QUALITY MEASUREMENTS

00110

R. I. Larsen

DETERMINING SOURCE REDUCTION NEEDED TO MEET AIR QUALITY STANDARDS. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper III/8.) pp. 60-4.

Air pollutant concentrations can be expressed as a function of location, averaging time, and frequency that a certain concentration is exceeded. Concentration data can be used with air quality standards to calculate the overall source reduction needed to meet a standard. The calculations can be refined to consider the effects of future growth, rural background concentrations, secondary pollutants arising from photochemical and other atmospheric interactions, and the contribution from each source or source type in a city. (Author)##

00017

AIR QUALITY DATA. (ANNUAL REPORT FOR 1962) (NATIONAL AIR SAMPLING NETWORK). Public Health Service, Cincinnati, Ohio Div. of Air Pollution, 52p.

This report contains summaries of air quality data for particulate and gaseous pollutants obtained from samples collected by stations of the National Air Sampling Network during 1962. Included also are data obtained by the analysis of selected particulate samples collected during the period 1958-1961. For the first time data from State Air Sampling Network report. This is a logical step, as procedures are standard and data are comparable. The following state networks provided data for inclusion in this 1962 report: Maryland, Massachusetts, Montana, Texas, and Washington. (Author)##

00005

S. Hochheiser, S. W. Horstman, and G. H. Tate, Jr.

A PILOT STUDY OF AIR POLLUTION IN BIRMINGHAM, ALABAMA (WIDE-ANGLE VIEW OF BIRMINGHAM FROM VULCANS STATUE). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. May 1962, 68p.

Air samples were collected for measurement of dustfall, suspended particulates, smoke shade, sulfur dioxide, nitrogen oxides, total oxidants, carbon monoxide and hydrogen sulfide. Air pollution data obtained during the summer phase of the study can be considered as representative. Mean values of gaseous pollutants were: SO2, 0.01 ppm; nitrogen oxides, 0.04 ppm; oxidants, 0.03 ppm; CO, 1.8 ppm. Maximum levels measured were: SO2, 0.18 ppm; nitrogen oxides, 0.14 ppm, oxidants, 0.14 ppm; CO, 12.5 ppm. Mean values for particulate pollutants, measured during the fall study, were: dustfall, 76 tons/sq.mi./mo.; smoke concentration, 1.5 cohs/1000 linear ft.; suspended particulates, 113 micrograms/cu.m. Maximum levels were: dustfall, 121 tons/sq.mi./mo.; smoke concentration, 6.2 cohs/1000 linear ft.; suspended particulates, 279 micrograms/cu.m. Mean values measured during the summer study were: dustfall, 49.3; smoke concentration, 0.6; suspended particulates 106. Maximum levels were: dustfall 95.6; smoke concentration, 3.0; suspended particulates, 206. Substantially higher levels of particulate and gaseous pollutants were recorded in the fall, indicating that emissions resulting from the combustion of fuels for industrial, commercial and domestic space heating contribute significantly to over-all air pollution during the heating season.##

00041

W.F. Ashe

HEALTH EFFECTS OF ACUTE AIR POLLUTION EPISODES. Ohio State Univ., Columbus, School of Medicine. (Presented at the National Conference on Air Pollution, Washington, D.C., Nov. 1958.) Nov. 19, 1958, 9p.

Air pollution can and has produced serious illness and even death. However, since all industrial cities, the world over, produce air pollution in tons per day all the time, and since there are only a handful of authenticated episodes of acute illness due to it, one must conclude that acute illness and/or death due to air pollution is unusual. The situation which produces dangerous air pollution is a particular kind of weather which is predictable. The prediction and prevention of air pollution episodes must be approached with utmost caution.##

00050

G.B. Welsh

AIR POLLUTION IN THE NATIONAL CAPITAL AREA. Public Health Service, Washington, D.C., Div. of Air Pollution, July 1962. 48p.
CFSTI: PB168314

This appraisal of air pollution problems in the Metropolitan Washington Area had three objectives: (1) To review and evaluate the existing and potential air pollution problems of the Metropolitan Area. (2) To review briefly air pollution control

activities presently being conducted by the respective local governmental agencies. (3) To develop recommendations for the guidance of local officials in meeting existing and future air pollution problems. The scope of the study was limited to consideration of available information regarding air pollution, including: activities which cause pollution, evidence of pollution levels, meteorological and topographical influences on dispersion of pollutants, local air pollution control activity, and other

00136

G. Arnold and E. Edgerley

URBAN DEVELOPMENT IN AIR POLLUTION BASINS - AN APPEAL TO THE PLANNERS FOR HELP. J. Air Pollution Control Assoc. 17, (4) 235-7, Apr. 1967. (Presented at 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966.)

Under local inversion conditions, an air basin holds a great mass of cool air like water in a saucer, forming a quasi-closed system that holds pollutants within. Urban centers in such basins tend to stagnate, like the constrained air itself. Understanding the air circulation patterns in these air basins is essential to air resource management and urban planning. A practical recommendation from the planners would be to locate urban centers at higher elevations, where effluents are dispersed by swift winds that are relatively free of surface friction. Airline pilots would be overjoyed to find excellent visibility at airports distributed on the mesas. Control officials and meteorologists appeal to the metropolitan planners to help reverse the trend that has brought congestion and pollution to our low-lying trade terminals. (Author abstract) ##

00149

J. F. Clarke, and R. B. Faoro

AN EVALUATION OF CO2 MEASUREMENTS AS AN INDICATOR OF AIR POLLUTION. J. Air Pollution Control Assoc. 16, (4) 212-8, Apr. 1966.

Measurements of ambient CO2, made at the Continuous Air a rural location near Cincinnati are presented and evaluated to determine the significance of CO2 data in urban air quality monitoring programs. Through analysis of rural CO2 data and evaluation of combustion sources by means of a diffusion model, it is demonstrated that the variation of urban CO2 concentrations around the prevailing atmosphere background level results from combustion and noncombustion (natural) sources. The concentration from natural sources can be substantial and in fact override the combustion sources. Because it is not yet practical to predict the contribution of natural sources to urban CO2 concentrations, data obtained for this gas have only limited utility as an index of air quality. Significant statistical relationships between CO2

data and air quality measurements for summer months are shown to result from similar meteorological effects rather than similar sources. A seasonal and spatial variation of these relationships is postulated and subsequently demonstrated by analysis of CO2 and air quality measurements from New Orleans, Louisiana, and St. Louis, Missouri (Author)

00218

P. J. Lawther

THE CLINICAL SIGNIFICANCE OF DIRTY AIR. Proc. Natl. Smoke Abatement Soc., (Southport, Eng., 1956.) 7 pp.

The general problems of air pollution are reviewed briefly in relation to complexities which face the investigators of air pollutants. In particular smog and motor vehicle emissions are discussed.##

00241

R.W. Hurn D.E. Seizinger

AIR POLLUTION INVENTORY - ENTER THE DIESEL. Proc. Am. Petrol. Inst., 45(111):127-132, May 1965. (Presented at the 30th Midyear Meeting, American Petroleum Inst. Div. of Refining, Montreal, Canada, May 10, 1965.)

Exhaust gases from truck-type diesel engines tested on a dynamometer stand were shown to involve hydrocarbons, oxides of nitrogen, and formaldehyde in significant quantities. Without reference to similar modes of operation, each class of pollutant was found to be generated in the diesel combustion in concentrations comparable to concentrations found in automotive (gasoline-powered) equipment. Although some trends in the data were observed, the experimental program was not extensive enough to justify conclusions regarding effects of fuels, engine design, or mode of engine operation. In comparing present findings with previously published information, the authors have noted interpretations of data that do not readily reflect the significan magnitudes of diesel emissions. Both the real contribution of diesels to air pollutant loading and the participation of these pollutants in the photochemical system should be weighed more carefully. (Authors' abstract)##

00251

L. R. Reckner, W. E. Scott and W. F. Biller

THE COMPOSITION AND ODOR OF DIESEL EXHAUST. Proc. Am. Petrol. Inst. 45(111):133-147, May 1965. (Presented at the 30th Midyear Meeting, American Petroleum Inst. Division of Refining, Montreal, Canada, May 10, 1965.)

Sampling and analysis techniques are described for determining light hydrocarbons, oxides of nitrogen, formaldehyde, acrolein, total aldehydes, total particulate, and polycyclic aromatic hydrocarbons in diesel exhaust. Using the techniques described, results are reported on the composition of exhaust from two diesel engines, a two- and a four-cycle, under a variety of operating conditions. Smoke ratings using different techniques are also reported and compared to total particulate results. No correlation was found between smokemeter ratings and particulate loadings at other than black smoke conditions. Human panel observations of exhaust odor are being made as part of a continuing program, but no panel data are reported. (Authors' abstract)##

00321

R. I. Larsen, C. E. Zimmer, D. A. Lynn, K. G. Blemel

ANALYZING AIR POLLUTANT CONCENTRATION AND DOSAGE DATA. J. Air Pollution Control Assoc. 17, (2) 85-93, Feb. 1967. (Presented at the 59th Annual Meeting of the Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-93.)

Continuous air pollutant concentration data have been analyzed for carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, nitrogen oxides, oxidant, and sulfur San Francisco, and Washington for years 1962 through 1964. Concentrations are approximately lognormally distributed for all pollutants in all cities for all averaging times. Maximum concentration is inversely proportional to averaging time to an exponent. Air pollutant dosage (concentration times time) above various threshold concentrations has been computed for all of the pollutants in all of the cities for year 1964. Equations have been developed from these analyses to predict the frequency of occurrence of air pollutant dosages of various intensities as a function of the geometric mean and standard geometric deviation. An example is shown for predicting the number of occurrences of sulfur dioxide dosages that might cause acute plant damage. (Author)##

00435

R. I. Larsen

A METHOD FOR DETERMINING SOURCE REDUCTION REQUIRED TO MEET AIR QUALITY STANDARDS. J. Air Pollution Control Assoc. 11(2):71-76, Feb. 1961.

A computer program was written to calculate arithmetic and geometric correlation and regression between any two variables for various periods of time, location, and condition of solar radiation. Two thousand correlation coefficients and the associated regression lines of best fit were calculated to explore the interrelationships between variables. The summary punched

cards were the input to this computer program. The purpose of those analyses is to show the frequency of occurrence of various values of oxidant, eye irritation, and visibility; to indicate the equations relating these pollutant effects to concentration of carbon monoxide; and to show the usefulness of this information for predicting removal of precursor, as measured by carbon monoxide, necessary to obtain given levels of improved air quality.##

00445

M. Tsuge, K. Ogawa and K. Sakai

RELATION OF ATMOSPHERIC CONTAMINATION WITH AIR IONS.
Mitsubishi Denki Giho (Tokyo) 40(3):462-466, Mar. 1966.
Text in Japanese

Air ions were found to have close relationship with contamination of air. There are several methods to measure the degree of contamination. Ion density meters, digital dust meters, and gas detectors are employed to obtained numerical indication of positive ions, negative ions, dust and CO2. As a result of investigation, it is confirmed that the quantity of air ions is correlated to the quantity of dust in the atmosphere. (Author summary)##

00526

Middleton, J. T.

CONTROL OF ENVIRONMENT - ECONOMIC AND TECHNOLOGICAL PROSPECTS.
Preprint. In: Environ. Improvement: Air, Water, Soil, pp. 53-71, Oct. 1966. (Presented at the Dept. of Agriculture on or about May 24, 1966)

Man's exploitation of land, water, and air has caused serious pollution of his environment, not only affecting man but other living organisms, quality of the land, water, and air resources. Not only must large sums of money be spent to restore the quality of man's environment, but it must be done quickly. The quality of air is determined by the uses made of air and by the pollutants injected into it by man. While some air contamination results from pesticides and chemical manufacturing the greatest degradation results from the use of air to support combustion. Principal pollutants from combustion for the development of energy and the propulsion of motor vehicles, and the manufacture of goods are liquid and solid particles, oxides of S and N, organic vapors, CO2 and CO. The pollutant released in largest quantities throughout the nation is SO2, amounting to 23,300,000 tons a year. The quality of air within a given air shed depends upon the nature of pollutants, the quality of the air supply and the geographical and meteorological factors affecting the movement and dispersal of contaminants. One result of multiple pollution sources is the combination of N oxides and organic vapors in the presence of sunlight, resulting in photochemical air pollution i.e. ozone, peroxyacetyl nitrate

(PAN), aldehydes, and organic acids. The resulting pollution effects are metal corrosion, building and fabric deterioration, cracking of rubber, visibility reduction, forest and agriculture damages, livestock injury health problems, and the spoiling of air environment. The recognized importance of these effects, the recognition of air pollution as a social problem, and the enactment of legislation to control air quality has occurred at both state and national levels.##

00528

R. E. Hatchard

PORTLAND'S NEW AIR QUALITY CONTROL PROGRAM. Preprint. (Presented at the Second Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Portland, Oreg., Nov. 5-6, 1964.)

After ten years of developmental steps, the city of Portland is moving forward rapidly to implement the new Air Quality Control Code. The new registration program will produce a large quantity of detaild information regarding community sources. The ten dollar fee is helping to finance the initial program costs. The relatively large numbers of complaints received are being investigated and where violations are found, corrective action is forthcoming. Many long-standing smoke and other particulate source problems are being controlled. In the future, increased emphasis will be placed upon the control of local geographical areas within the City. This approach will be balanced with a planned community-wide control of similar industrial, commercial and public sources. Additional public informational activities are needed to develop support for the necessary changes to improve Portland's air quality conditions. (Author's summary)##

00534

C. B. Robinson, F. L. Meadows, and J. J. Henderson

AIR POLLUTION PATTERNS IN THE GREATER BIRMINGHAM AREA. Preprint. 1965.

In 1962, the Alabama Respiratory Disease and Air Pollution Study was initiated to determine the prevalence of various pulmonary disorders and to relate these findings with air quality data. This paper describes part of the aerometric effort begun in December 1963 in the Greater Birmingham Area. Samples for analysis of suspended particulate, dustfall, sulfation, and 24-hour gases (nitrogen dioxide, sulfur dioxide, and aldehydes) were collected routinely from 21 stations located primarily in residential areas. The sampling network, analytical methods, and statistical procedures used are discussed. Air quality results are presented with emphasis on spatial and temporal variations. (Authors' abstract)##

00644

C. M. Copley, Jr. and H. C. Mitchell

AIR QUALITY OF THE ST. LOUIS METROPOLITAN REGION. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-137.)

The St. Louis Metropolitan region is an interstate area of about 2500 square miles consisting of 3 counties, St. Louis, St. Charles and Jefferson and the City of St. Louis in Missouri, and 3 counties, Monroe, St. Clair and Madison in Illinois. It has a population of about 2 million and a widely diversified commercial and industrial make-up. t is also a transportation hub. As a part of the Interstate Air Pollution Study, a cooperative project of the U.S. Public Health Service and 10 local area agencies, a large variety of air sampling networks were operated in the region collecting data far in excess of a year. Sampling stations for particulate matter included 41 dustfall, 16 Hi-vol, 12 AISI and 1 pollen; for gaseous pollutants, 4 sequential SO2, 20 winter 24 hour SO2 and 9 summer oxidant. In addition, 36 corrosion testing stations were operated for 16 months and a CAMP station for 4 months. This paper reviews the large volume of data collected by these sampling networks in comparison with findings of other studies and suggested air quality standards. (Author abstract) ##

00666

A.V. Forde D.H. Matheson

THE DESIGN AND OPERATION OF A MUNICIPAL AIR POLLUTION SURVEY. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-80.)

A municipally conducted air pollution survey has been carried out in Hamilton, Ontario over the past ten years. The results of the survey are considered in some detail, and conclusions drawn. Some observations concerning the design and operation of an area survey are made.##

00688

D. H. Matheson, E. E. Munn, and J. Wingfield

OZONE LEVELS AT HAMILTON, ONTARIO. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-115.)

The presence of ozone or other oxidants in normal and polluted atmospheres is receiving increasing attention, even in northern cities where polluted atmospheres are normally chemically reducing

in character. Only limited information is available concerning the concentration of ozone and the temporal pattern of its occurrence in Canada, although there is accumulating evidence that its presence may be a factor in certain agricultural damage in Southern Ontario. In 1961 a meteorological air pollution research study was begun at Hamilton, under a Federal Health Grant. Hamilton is a particularly appropriate site for this study since it is a large industrial city, located on the lake where its weather is subject to lake influences. The 300-ft high Niagara escarpment passes through the city and materially affects the transport and dilution of pollutants through modification of the wind pattern. The project includes the operation of a 200-ft meteorological tower, and air pollution measurements at a number of sites, of soiling index, aerosol loadings, SO2, nitrogen oxides, total oxidants and ozone. Observations in the period April 1963 to December 1964, inclusive are reported. Hamilton is an industrial city of 280,000 population with 325,000 people in the metropolitan area. The predominating industries are two large basic steel plants, producing two-thirds of Canada's output. In addition, there is a wide variety of other industries, including electrical, chemical and machinery manufacturing. The city is located on the south shore of Burlington Bay and Lake Ontario at the western tip of the lake. A large proportion of the city, including the industrial area, is on a level plain. The Niagara escarpment passes through the city from east to west, and about one-half of the residential area of the city is on the upper level. Since the predominant winds are west and south-west, the industry is favorably located as far as the city is concerned for dispersion of its air-polluting emissions over the lake.##

00698

R. B. Faoro

A STUDY OF SAMPLE AVERAGING TIMES AND PEAK-TO MEAN RATIOS FOR GASEOUS POLLUTANTS. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-90.)

The purpose of this paper is to demonstrate the effect of sample averaging time upon measurements of air quality. Frequency distributions of concentrations of selected gaseous pollutants, based on data from the Continuous Air Monitoring Program, are presented. An analysis of the ratio of peak-to-mean concentrations shows the relationships between this ratio and such factors as season, time of day, and atmospheric stability. (Author abstract)##

00730

E.H. Ilgenfritz, J.F. Shively, H.E. Krienke

SURVEYING AIR QUALITY AT DOW CHEMICAL COMPANY (AIR POLLUTION CONTROL ENGINEERS EXPLAIN). Air Eng., 7(10):20-28, Oct. 1965 (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

An 18-station survey program was established in 1958 for Midland, Michigan, headquarters of The Dow Chemical Company and location of the Midland Division. This site contains a chemical complex with over 500 organic and inorganic chemical processes. Measurements of dustfall sulfation, sulfur dioxide, suspended dust, stain index, chlorides, hydrocarbons and corrosion are recorded and correlated with meteorological data. Air Pollution complaint data are also recorded both within the plant and in the community and form a part of this surveillance program. (Author's abstract) ##

00739

C.E. Zimmer R.I. Larsen

CALCULATING AIR QUALITY AND ITS CONTROL. J. Air Pollution Control Assoc., 15(12):565-572, Dec. 1965. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

Air quality is shown as a function of averaging times of five minutes to one year for carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, nitrogen oxides, oxidant, and sulfur dioxide in Chicago, Cincinnati, Los Angeles, New Orleans, Philadelphia, San Francisco, and Washington, D. C. Concentrations are approximately lognormally distributed for all pollutants in all cities for all averaging times. Maximum concentration is inversely proportional to averaging time to an exponent. The exponent is a function of the standard geometric deviation. General air quality and control parameters are derived and shown for one example, nitrogen oxides in Washington, D. C. These values are compared to one air quality standard. (Authors' abstract) ##

00781

L. Friberg R. Rylander

SCIENTIFIC BASIS FOR SOME MEDICAL AIR QUALITY GUIDES. J. Air Pollution Control Assoc. 15, (11) 531-4, Nov. 1965.

An attempt to develop medical air quality guides was recently made in Sweden. Even if air pollution is presented in only fairly small amounts, problems frequently arise especially concerning nuisance reactions. Present regulations do not provide a basis for a standardized treatment of air pollution problems. The national air pollution situation was discussed and a survey of the literature was performed to collect data concerning current air pollutants. For sulfur dioxide a 30 day value of eight pphm and a two hour value of 25 pphm was recommended. It was further recommended to keep the carbon monoxide concentration as low as possible with an eight hour value of 30 ppm as an absolute maximum. For carcinogenic and mutagenic substances it was also recommended to keep the values as low as possible. Although available data did not support complete medical guides in all cases it was decided rather to have the above approximations than to leave the air pollution situation uncontrolled. (Author abstract) ##

00802

I.H. Williams

AN ATHOSPHERIC SURVEY OF CHILLIWACK, BRITISH COLUMBIA. Preprint. 1963.

A one-year study of the air pollution level of the City of Chilliwack has been completed. Methods employed and data collected for dustfall, sulfation rates, soiling index, hydrogen sulfide, oxidants and total hydrocarbons are presented. Difficulties experienced in the determination of very low oxidant levels are discussed. The results obtained indicate that the City is particularly free of air pollutants and thus will serve as a suitable base for comparative studies on the relationship between air pollution and other factors in the prevalence of certain chronic respiratory diseases. (Author abstract)##

00847

J.D. Williams N.G. Edmisten

AN AIR RESOURCE MANAGEMENT PLAN FOR THE NASHVILLE METROPOLITAN AREA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. Sept. 1965. 160 pp.
GPO: 822-811-8, HEW: 999 AP - 18

This report is based on the numerous technical and scientific papers resulting from a major study of air pollution and effects made in Nashville, Tennessee, by the Public Health Service, Vanderbilt University, and state and local agencies during 1958-59. These papers have been supplemented by field investigations to complete the background information needed for preparation of an air resource management program plan. The report summarizes a number of the technical and scientific papers and uses all of them to develop new concepts as well as unify new and old approaches to air pollution control in preparation of the air resource management program plan. Air quality goals and the means to reach those goals are suggested. Supporting data are provided and methodology adapted for relating air quality goals to control of emissions. Methods for predicting air pollutant levels by use of mathematical models are presented. Public opinion survey results and their implications for the air resource management program are given. The report has specific use for development of an air resource management program in Nashville and general use for program development and reference in many other places. (Author abstract)##

00913

A. Marsh, (Ed.)

SULFUR DIOXIDE AS AN ATMOSPHERIC POLLUTANT. National Society for Clean Air, London, 1964, 32p.

Author discusses such sulfur dioxide problems as: Sources and Extent of Sulfur Dioxide Pollution; Effects of SO2 on Humans and Plant Material; Removal of SO2 from Flue Gases; Dispersion by Temperature, Velocity and Weight; Reduction of Emissions through Improved Efficiency and Technical Developments; Control of Emissions by Regulation of Fuel Usage. Author states in conclusion that the problem of SO2 in the atmosphere is one that calls for a variety of controlling solutions. It is apparent there is no prospect in the immediate future of entirely eliminating this gas, but that, through the means that have been indicated much can be done to reduce the total emissions and to reduce its concentrations in the air.##

01010

A REPORT TO THE LEGISLATURE ON AIR POLLUTION IN COLORADO. Colorado State Dept. of Public Health, Denver. Feb. 5, 1964. 66 pp.

A series of studies by the State Department of Public Health, local health departments and other interested agencies and groups led to the present Colorado Air Pollution Law calling for the State Department of Public Health to study the air pollution problem and to recommend ambient air standards and control measures. Colorado is experiencing a rapid growth of population, urbanization and sources of air pollution, and meteorological and topographical features over much of the State are conducive to the development of serious air pollution conditions. With the assistance of the Colorado Air Pollution Advisory Committee, the State Dept. of Public Health has recommended standards for ambient air quality in the State. Air quality monitoring programs in six of Colorado's largest cities were conducted and much information about the extent and nature of the air pollution problem was obtained. Three monitored areas (Denver Metropolitan Area, Boulder and Pueblo) definitely do not meet the ambient air quality standards established and one (Grand Junction) might not meet the standards. The geographical air pollution basins of the areas that do not meet the standards have been outlined, with the exception of Boulder. The geographical boundaries for Boulder will be determined at an early date. Measures for the abatement of air pollution within the State have been recommended and are listed. (Author summary)##

01017

S. S. Griswold

COMMUNITY CONTROL OF AIR POLLUTION-POTENTIALS AND LIMITS. Arch. Environ. Health Vol 9:606-608, Nov. 1964. (Presented at the American Medical Association Congress on Environmental Health Problems, Chicago, Ill., May 1-2, 1964.)

Curtailment of vehicular pollution, combined with a largescale control program for stationary sources, such as is now operating Los Angeles, can reduce pollution in any community to the point

where it is no longer a significant problem. Thus, the limitation upon air pollution control, if there be any, cannot be said to be technical. Is the limitation then economic? In Los Angeles, these objections were disregarded and the economic effect upon industry of the most stringent air pollution control program in the world did not cause a ripple. Ignorance and apathy are the real limitations upon the control of air pollution. A community endures air pollution because it lacks leadership and the will to act. The public does not understand, and the community leaders, for one reason or another, are placing higher values upon what we have seen are specious arguments that air pollution can not be controlled, or costs too much to control. The potential for controlling pollution is adequate for present problems. The only real limitation upon a successful air pollution program is the failure to understand and act in time. Members of the medical profession have an important responsibility in seeing that this potential is recognized and these limitations overcome.##

01041

A. Bihm, Jr.

NEW YORK STATE'S CLASSIFICATIONS - AMBIENT AIR QUALITY OBJECTIVES SYSTEM. J. Air Pollution Control Assoc. Vol. 15:(11)519-522, Nov. 1965.

The air pollution potential of any area is directly related to its population and economic development. In New York State, this pollution potential ranges from that existing in the sparsely inhabited recreational zones to that prevailing in the densely populated and/or heavily industrialized areas. No one set of air quality standards or objectives can be developed which can reasonably be applied on a statewide basis. A classifications-air quality objectives system has been adopted by the State Air Pollution Control Board for application in New York State. In accordance with this system, specific areas can be classified in one of 16 categories. Air quality objectives, in keeping with each classification are designed to protect health and to promote the maximum comfort and enjoyment and use of property consistent with the needs of the area concerned. The system was developed by the staff with the assistance of a council of technical advisors. Units of measurement related to the most important effect of specific contaminants are utilized. Methods of sampling and analysis are specified. The details of the classifications-objectives system, the place of the system in the state's air resource management plan, the manner in which each segment of the state after study will be classified, and how attainment will be evaluated are described. (Author abstract)##

01095

C. E. Zimmer and G. A. Jutze

AN EVALUATION OF CONTINUOUS AIR QUALITY DATA. J. Air Pollution Control Assoc. 14, (7) 262-6, July 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

Sulfur dioxide data from the Continuous Air Monitoring Program (CAMP) for 6 cities are evaluated in relation to the following two objectives: (1) provide an indication of the levels of atmospheric pollution by gaseous contaminants that can be correlated with health and economic effects and (2) determine the optimum sampling time for studies of this type. Frequency distributions of five-minute concentrations were computed for both the summer and winter months for the 6 cities. Present analyses indicate that the optimum averaging time (sampling interval) for sulfur dioxide is 30 min or less. The frequency of occurrences of events of varying lengths of time in which the 5-min concentrations of SO2 exceeded levels specified in suggested air quality standards was computed. It is concluded that determination of simple excesses of a standard is insufficient to measure the seriousness of an air pollution event. Future work will be directed towards computation of measures of the total dosage over specified time intervals for all of the 6 gases now monitored by CAMP.##

01202

M. Nolan

A SURVEY OF AIR POLLUTION IN COMMUNITIES AROUND THE JOHN F. KENNEDY INTERNATIONAL AIRPORT (Sept. - Oct. 1964). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. June 1966. 82 pp.
GPO,HEW: 826-792-2

A 1-month air-quality study was conducted in the communities adjacent to John F. Kennedy Airport in Queens and Nassau Counties, New York, from September 24 to October 24, 1964. Eight sampling stations were located in the area. Limited measurements of particulate matter and hydrocarbons, and odor observations yielded some evidence to indicate that aircraft operations contributed a small amount to particulate and hydrocarbon concentrations and to odor occurrence. Concentrations of particulates, odors, and hydrocarbons at the sampling stations were substantial and came from many sources in the metropolitan area. Thus, the small variations that occurred in measured air quality were not significantly correlated to aircraft emissions on a statistical basis. The number and percentage of jet aircraft using water injection during takeoff decreased markedly from 1963 to 1964 at the J. F. Kennedy Airport; therefore, smoke emissions caused by water injection have been reduced. This downward trend is expected to continue. Meteorological conditions during the study were near normal for this period of the year. Poor conditions for atmospheric dispersion were experienced for a 5-day period; however, no prolonged severe atmospheric stagnation occurred. Therefore, air contaminant concentrations that would exist under extremely adverse meteorological conditions could not be measured. The limited, modest studies did not show any difference in the characteristics of particulates emitted from jet, diesel, or gasoline engines.##

01257

K. Biersteker, H. DeGraaf, and A. G. Mass

INDOOR AIR POLLUTION IN ROTTERDAM HOMES. Intern. J. Air Water Pollution 9, 343-50, 1965.

800 paired samples of indoor and outdoor smoke and SO2 concentrations of 60 Rotterdam homes were studied in an effort to throw more light on the role that indoor air pollution may play in epidemiology. It was found that smoking increased the amount of smoke found in living rooms and the data suggest that newer houses tend to have less SO2 in the living rooms than older houses. On the average living rooms contained approximately 80 per cent of the smoke and 20 per cent of the SO2 measured simultaneously outdoors during 24 hr periods. The probability of having more SO2 in the living room than outdoors is estimated at less than 2 per cent of the days, but the findings of constant high SO2 in one living room in this small sample may mean that faulty chimneys and heaters may play a bigger role in air pollution mortality during fogs than so far has been suspected. (Author abstract)##

01270

M. Katz

QUALITY STANDARDS FOR AIR AND WATER. Occupational Health Rev. (Ottawa) 17(1):3-8, 1965. (Presented at the Occupational Health and Safety Conference, Canadian Congress of Labour, North Bay, Ontario, Nov. 16, 1964).

Author reiterates air quality standards and threshold limit values for gases and vapors (ppm) in the USSR and USA: ambient air quality standards and workroom air threshold limit values for some gases (carbon monoxide, chlorine, hydrogen chloride, ethylene, ozone, oxides of nitrogen and sulfur dioxide); air quality standards and threshold limit values for solids or liquids; and comparative ambient air quality standards for particulate matter. Data are given for California, Oregon, USSR, Czechoslovakia and West Germany.##

01427

J. P. Lodge, Jr. and J. B. Pate

ATMOSPHERIC GASES AND PARTICULES IN PANAMA. Science, Vol. 153:408-410, July 22, 1966.

The concentrations of trace gases in tropical air from samples taken on the Isthmus of Panama are compared with those reported by others. The role of a tropical land mass as a sink or source of atmospheric components is discussed. (Author abstract)##

01594

AIR POLLUTION MEASUREMENTS OF THE NATIONAL AIR SAMPLING NETWORK - ANALYSES OF SUPENDED PARTICULATES 1963. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. 1965. 90 pp.

In 1963 the National Air Sampling Neteork encompassed some 200 stations. This report presents the results of analyses performed on samples collected at these stations in 1963 and also results of analyses performed in 1963 on some samples collected in previous years. These results are tabulated in the Summary Table. Most pollutant levels are reported as geometric means (designated hereafter as 'neans') for reasons discussed in Appendix A. Where it is not feasible to calculate the geometric parameters, arithmetic means are used. (Author summary modified)##

01770

F. A. Bell, Jr.

SHORT-TERM AIR POLLUTION STUDIES. Civil Eng. N.Y. 33, 48-51, Feb. 1963.

Air pollution studies designed to measure the concentration of oxidants, carbon monoxide, sulfur dioxide, nitric oxide and nitrogen dioxide in the cities of Washington, D.C., Lynchburg, Virginia, Tucson, Arizona, Phoenix, Arizona and Fresno, California are discussed. The area surveys are conducted over a short term time period and author elucidates the advantages and disadvantages of this approach.##

01782

J.J. Schueneman

AIR POLLUTION PROBLEMS AND CONTROL PROGRAMS IN THE UNITED STATES. J. Air Pollution Control Assoc. 13, (3) 116-25 Mar. 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962

There is ample information at hand that the air pollution problems before us are of major importance. These range all the way from excessive dustfall at a home located across the road from a portable asphaltic road mix plant in a rural area to the complex and extensive problems of the megalopolis of the eastern seaboard. It is also clear that inadequate attention is being given to these problems. While today we seem to be "getting by" with the misuse of our air resources, it appears that the rate of growth of our country will surely force us to conserve and manage our air resources, whether we want to or not. The growth

of our country is fast and seems to take no special prodding but the growth of our air pollution control programs takes years and a lot of "doing." The time to start has passed. While some states and communities have started, a further major increase in efforts is required if we are not to find ourselves in the year 2000 with cities more blighted than were St. Louis, Pittsburgh, and their brethren, 25 years ago. (Author abstract)##

01829

W. J. Basbagill

AIR CONTAMINANT MEASUREMENTS AT ROOSEVELT FIELD, NASSAU COUNTY, NEW YORK(JANUARY - FEBRUARY 1964). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. July 1965. 53 pp.

Based on the meteorological conditions observed, contaminant levels measured during the study may be considered typical for this site during the winter months. Since there were no cases of severe atmospheric stagnation during the study, measurement of maximum contamination levels was not possible. Conclusions based on the data obtained in this study are: (1) Particulate matter contamination as indicated by soiling index measurements was "heavy" to "extremely heavy" about 9% of the time; this indicates that air contamination from emission of small-sized particulates should be reduced. (2) SO2 concentrations were excessive. Action to control emission of this contaminant should be considered. (3) CO and oxides of nitrogen concentrations were somewhat greater than desirable. (4) Photochemical smog was not present, nor was it expected at this time of year. It is recommended that the existing air monitoring program be expanded. The number of sampling sites should be increased and measurement of other contaminants should be initiated. These data will indicate seasonal variations in pollution, measure the effectiveness of air resource management programs, document long-term trends of air quality as related to changes in the nature of contaminant sources, and relate air contamination to its effects. Because air contamination does not recognize political boundaries, this air monitoring program and other aspects of the air resource management program should extend throughout the entire county. Data from surrounding jurisdictions should be considered also.##

01830

R. M. Brice and J. H. Ludwig

THE DISTRIBUTION OF VEHICULAR AIR POLLUTION IN THE UNITED STATES. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper 65-21.)

The contribution of automotive vehicular emissions to air pollution and the magnitude of the effects of these emissions have been well documented in Los Angeles County and to a lesser extent throughout the State of California. Data are

presented which show the presence of photochemical "smog" and prevalence of "smog" in eastern communities is not as high as in Los Angeles; however, evidence from most large cities where atmospheric pollutants have been measured shows some photochemical activity with production of oxidants throughout the year and severe "smog" when adverse meteorological conditions occur. Plant damage of the types associated with photochemical pollutants has been observed in many areas throughout the country and further indicates the presence of adverse levels of motor-vehicle-derived pollutants. Source surveys in a number of cities in the United States show that motor vehicles are responsible for very appreciable amounts of the total emissions of hydrocarbons, nitrogen oxides, and carbon monoxide. The facts presented clearly point to potential problems under current conditions and problems of increasing severity as population densities and use of motor vehicles increase. (Author abstract)##

01864

SIXTH ANNUAL REPORT OF THE AUCKLAND AIR POLLUTION RESEARCH COMMITTEE. (Annual Rept. 1965). Auckland Air Pollution Research Committee, New Zealand Mar. 31, 1965. 42 pp.

This is the Sixth Annual Report of the Auckland Air Pollution Research Committee presented to the Local Authorities of Metropolitan Auckland, and it summarises the first 3 years of the planned 5 year survey. The main work of the Committee has been in three fields. The first field has been a continued study of the meteorological and topographical conditions that affect air pollution in the metropolitan area. Inversion conditions which contribute to concentration of pollutants in certain areas, exist quite frequently during the night, particularly in autumn and winter. However, present records show that these conditions do not persist during the day, so that cumulative concentrations are avoided. The second field has been the continuation of the five-year metropolitan air pollution survey, now in its third year. The records continue to indicate that no major problem yet exists. The third field concerns atmospheric pollution by motor vehicles. Records indicate that the position is satisfactory, even though the ratio of vehicles to population in Auckland is similar to that in Los Angeles where a serious pollution problem is known to exist. New and modern equipment, including an infra-red gas analyser, have been used in obtaining these records. Pollution figures have been obtained in city streets and in offices at various locations above street level. Smoke from heavy diesel vehicles is the main adverse feature, and this is particularly evident in the Newmarket results. This points to the need in a number of cases for better maintenance of transport fleets, and regular checks on their operating efficiency. (Author introduction)##

01912

D. A. Lynn and T. B. McMullen.

AIR POLLUTION IN SIX MAJOR U.S. CITIES AS MEASURED BY THE CONTINUOUS AIR MONITORING PROGRAM (CAMP). J. Air Pollution

Control Assoc. 16, (4) 186-90, Apr. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-92.)

Data obtained by the Continuous Air Monitoring Program (CAMP) in six cities during 2 years are summarized. Six gaseous pollutants were monitored in Cincinnati, Chicago, New Orleans, Philadelphia, San Francisco, and Washington, D.C. during 1962 and 1963. The data serve as a basis for describing several contrasts and similarities in the nature of air pollution experienced in six cities, which represent a broad geographical and climatological range of urban environments. Specific topics covered are: typical pollutant levels, patterns of daily and seasonal variations, and unusual phenomena such as atmospheric stagnation periods and photochemical smog formation. (Author abstract) ##

01949

P. W. Hildebrand and R. L. Stockman

AIR QUALITY IN CLARK COUNTY, WASHINGTON. Washington State Dept. of Health, Olympia, Division of Environmental Health. 74 PP.

This is a report on a community air pollution survey which began Feb. 1, 1961 and which was conducted in cooperation with the Clark County Air Pollution Committee and the Clark-Skamania Health District. The following findings, and conclusions, are given. Clark County air pollution problems are primarily restricted to localized areas in the immediate vicinity of specific sources. Existing nuisance conditions and the potential for an area-wide problem in the near future warrant corrective and preventive action on the part of the community. Air pollution concentrations in Portland, Oregon are demonstrably higher than those measured in Clark County leading to the conclusion that area-wide pollution in the County will increase as community development progresses. Air pollution effects that can be established include fallout of solid materials, odor, soiling, and esthetic considerations. Heating and transportation make significant contributions to the total problem. Gaseous emissions and concentrations have not been studied sufficiently to establish their effects upon the community. Local legislation is presently inadequate to control the problem on either a corrective or preventive basis. This report recommends that an air pollution control district, as provided for by the laws of the State of Washington, be established encompassing Clark County and the cities of Vancouver and Camas.##

01981

A. P. Altshuller and I. Cohen

THE GAS PHASE REACTIONS OF NITROGEN OXIDES WITH OLEFINS. Intern. J. Air Water Pollution 4, (1/2) 55-69, 1961. (Presented at the 134th Annual Meeting, American Chemical Society, Chicago, Ill., Sept. 1958)

The nature of the condensation products formed in the gas phase reactions of nitrogen dioxide and nitric oxide with pentene-1, 2-methylbutene-2, and 2-methylbutadiene-1,3 was investigated. The reactants were combined at partial pressures in the range of 0.1 to 2.5 mm with the total pressure at one atmosphere. The products were determined by infrared and ultraviolet spectroscopy and colorimetry. The condensates included primary and secondary nitro compounds and alkyl nitrates. Strong hydroxyl and singld bond carbon to oxygen stretching vibrations indicate th presence of either nitroalcohols or simple aliphatic alcohols formed through oxidation reactions. Carbonyl stretching frequencies observable in some of the reactions support the conclusion that a portion of the reactants disappear by oxidation rather than by nitration processes. The available results do not indicate the presence of appreciable amounts of tert.-nitrocompounds, conjugated nitro-olefins, or gem-dinitroalkanes. The reactivities of the olefins with the nitrogen oxides are in the decreasing order: 2-methylbutadiene-1,3, 2-methylbutene-2, pentene-1. (Author abstract) ##

02179

L. E. Niemeyer.

SUMMER SUN - CINCINNATI SMOG: A RECENT INCIDENT. J. Air Pollution Control Assoc. 13 (8) 381-4, Aug. 1963.

Three conditions are considered necessary for the formation of photochemical air pollution: sources emitting air pollution, slow atmospheric dispersal of pollutants, and solar radiation. As we have seen, all three conditions were fulfilled in Cincinnati on the 16th and 18th of May. The city acted as the source of pollution. Probably the greatest contributors were the city's inhabitants as they came into the city by car and bus to begin their daily routine. The stagnated anticyclone that dominated the region, with its attendant clear skies, light winds, and well-developed radiation inversion, brought about slow atmospheric dispersal of pollution and permitted the sun's rays to act on the contaminated air mass without obstruction. The intense solar radiation did produce the photochemical reactions, but also produced enough surface heating to mix the contaminated air mass to heights well above 5000 feet-alleviating, to a degree, the high concentrations that occurred before inversion breakup. The meteorological conditions that brought about this incident, although not frequent in southern Ohio, may be expected periodically. These conditions can lead to excessively high pollution levels if the sources of contaminants remain at their present number or increase in quantity.##

02241

W.H. Perry E.C. Tabor

NATIONAL AIR SAMPLING NETWORK MEASUREMENT OF SO2 AND ¬NO2. Arch. Environ. Health 4, 254-64, Mar. 1962. (Presented at the Industrial Hygiene Foundation of America, Inc., Pittsburgh, Pa., Oct. 25-26, 1961).

The air in the cities participating in the NASN is currently monitored for sulfur dioxide and nitrogen dioxide. The sulfur dioxide method used by the Network pssesses good collection efficiency and sufficient sensitivity for the levels encountered. Slight losses of pollutant may occur in the inlet system and on aging of the solution after collection; these losses are minimized by periodic replacement of the prefilters and prompt analysis of all samples on receipt from the field. The nitrate solutions collected in the nitrogen dioxide method have adequate stability, and no significant influence is exerted by the inlet system. The method is necessarily empirical because of low collection efficiency and incomplete knowledge of the reactions involved in the conversion of mixtures of oxides of nitrogen to the nitrite ion. (Author summary)##

02317

W.J. Basbagill J.L. Dallas

AIR QUALITY IN BOSTON, MASSACHUSETTS (NOVEMBER-DECEMBER 1963). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. Nov. 1964. 55 pp.

A short-term air contamination pilot study was conducted using a mobile air-sampling laboratory. This laboratory, designed and constructed by the Technical Assistance Branch, Division of Air Pollution, Public Health Service, contains continuous automatic equipment for monitoring air quality, manual air-sampling equipment, meteorological instrumentation, and laboratory facilities. This mobile laboratory was used to: (1) obtain comprehensive measurements of gaseous and particulate air contaminants at a single test site, (2) train air-contamination investigators in the application of methodology, (3) evaluate and compare air-contamination measurement techniques, and (4) enhance public awareness of the air-contamination problem to encourage support for local air-contamination control and monitoring programs.##

02340

AIR QUALITY DATA FROM THE NATIONAL AIR SAMPLING NETWORKS AND CONTRIBUTING STATE AND LOCAL NETWORKS 1964-1965. Public Health Service, Cincinnati, Ohio, Division of Air Pollution pp. 128, 1966.

The Air Quality Section of the Public Health Service's Division of Air Pollution, with the assistance and cooperation of state and local agencies, carries on a variety of air sampling activities to obtain information about air quality in the United States. This report summarizes data gahtered during 1964 and 1965 at nearly 300 stations that gathered bi-weekly samples of suspended particulate matter, about 30 stations that gathered bi-weekly samples of two gaseous pollutants, and another seven stations that continuously monitored six gaseous pollutants,

suspended particulates and soiling index. This volume also continues the policy of including summaries of data contributed by state and local agencies that operate their own air sampling networks. This effort to bring together in one publication as much air quality data as possible is particularly important in light of the continuing rapid expansion of state and local sampling activities. In addition to the basic data on suspended particulates and gases, data on several fractions of the particulate matter are included herein. (Author abstract)##

02361

H.E. Landsberg

AIR POLLUTION AND URBAN CLIMATE. Proc. Intern. Biometeorol. Congr. 648-56, 1966. (Partial paper presented at the Third International Biometeorological Congress, Pau, France, Sept. 2-7, 1963.)

In this general review of air pollution in relation to meteorology, the author states that, although atmospheric motions are, in general, sufficient to dilute pollutants to a tolerable level, there is a high probability that once in three years a major pollution episode can be expected. With increased population, higher degree of industrialization and greater traffic densities of motor vehicles, the diluting and self-cleansing properties will become more and more taxed so that the frequency of adverse pollution episodes is likely to increase.##

02370

S. Duckworth E. Kupchanko

AIR ANALYSIS: THE STANDARD DOSAGE-AREA PRODUCT. J. Air Pollution Control Assoc. 17, (6) 379-83, June 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-94.)

The dosage-area product (DAP) is offered as a feasible, low-cost, and operationally useful data analysis output. It is in essence a smog index obtained by multiplying the contaminant dosage by the geographical area affected. Thus it represents the intensity and extent of an air pollution episode. The basic concepts of dosage and dosage-area, and some standard constraints for obtaining reproducible index values are discussed. Several practical uses of the DAP smog index are illustrated. It can be readily computed from a daily map showing the areal extent of contaminant dosage. The DAP Smog Index is recommended as a feasible aid in presenting and analyzing past, current, and future air quality conditions. It is suggested for use in studies of smog patterns, pollutant trajectories, smog experience, pollutant trends, and smog forecasting.##

02431

F. A. Bell, Jr., R. S. Burke, R. F. Pero, E. E. Thacker, R. Z. Widmer, J. G. Williams, Jr.

AIR POLLUTION MEASUREMENT STUDY IN RICHMOND, VIRGINIA, JANUARY 18-24, 1962. Virginia State Dept. of Health, Richmond Bureau of Air Pollution Control and the Public Health Service, Washington, D.C., Div. of Air Pollution. 1962. 20 pp.

This study was undertaken for the purpose of obtaining an initial estimate of gaseous pollution levels together with particulate matter levels and meteorological variables, and for introducing air pollution measurement techniques to State and local personnel. In general the gaseous concentrations were low except for sulfur dioxide, the source of which were the emissions from combustion of sulfur-bearing fuel, mostly from coal. Data and figures are given.##

02822

S. Hochheiser and R. E. Wetzel

AIR POLLUTION MEASUREMENTS IN INDIANAPOLIS (JUNE-JULY 1963). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution and Bureau of Air Pollution Control, Indianapolis, Ind. 67 pp., July 1964

The Indianapolis Bureau of Air Pollution Control and the Division of Air Pollution, U.S. Public Health Service conducted a joint air pollution study in June and July 1963. A mobile air sampling laboratory was used in the study. This laboratory contains continuous automatic equipment for monitoring air quality, manual air sampling equipment, meteorological instrumentation, and laboratory facilities. This mobile laboratory is used mainly to (1) obtain comprehensive measurements of gaseous and particulate air pollutants at a single test site in various communities; (2) train air pollution investigators in the application of methodology; (3) evaluate and compare air pollution measurement techniques, and (4) enhance public awareness of the air pollution problem and encourage support for local air pollution control and monitoring programs. Some of the data obtained in this study, such as the range of concentrations of air contaminants, relationships among levels of air pollutants, and the relationship of meteorological factors and air pollution levels are presented here. Detailed tabulations of air pollution and meteorological measurements are given in the Appendix. (Author introduction modified)##

02823

S. Hochheiser, M. Nolan, and H. J. Dunsmore

AIR POLLUTION MEASUREMENTS IN DUQUESNE, PENNSYLVANIA (SEPTEMBER-OCTOBER 1963). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution and Allegheny County Health Dept., Duquesne, Pa., Bureau of Air Pollution Control. Oct. 1964. 37 pp.

Air pollution levels are of sufficient magnitude to justify further planning and development of the air resource management program serving the Duquesne area. Pollution due to particulate matter is a major problem. Atmospheric particulate concentration exceeded 290 micrograms per cubic meter 50 percent of the time. Pollution due to sulfur dioxide is also a major problem. Hourly sulfur dioxide levels reached 0.66 ppm during a period of relatively poor atmospheric ventilation. Photochemical-type smog was not detected nor was it expected during the fall season. The potential of photochemical smog in Duquesne is greatest during the summer months. The resources available should be increased to permit a more extensive air resource management program. A continuing air monitoring program should be instituted at strategic sampling sites throughout the area to determine seasonal and yearly trends of pollution, and to provide information upon which to base control program decisions.##

02825

T. E. Kreichelt and E. W. Dahle, Jr.

AIR POLLUTION MEASUREMENTS IN BALTIMORE, MD. (MARCH AND APRIL 1964). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution and Baltimore City Health Dept., Md., Bureau of Industrial Hygiene, Nov. 1964. 58 pp.
GPO: 817-288-2

Air pollution concentrations measured in this brief study are sufficiently great to justify further planning and development of an air resource management program in the Baltimore area. Conclusions based on the limited data of this study are as follows: Pollution due to particulate matter is higher than desirable. Atmospheric particulate concentrations exceeded 200 micrograms per cubic meter 5 out of 36 days of the study or 14 percent of the time. Soiling index values were rated as "heavy" or greater during 22 percent of the study period. Pollution due to sulfur dioxide is sometimes a problem. The average sulfur dioxide concentration during the study was 0.06 ppm but did reach an hourly concentration of 0.24 ppm. Photochemical-type smog was neither detected nor expected during the spring season. The relatively large concentrations of oxides of nitrogen, hydrocarbons, and aldehydes present suggest, however, that photochemically produced smog may be a problem during the summer months with the occurrence of greatest intensity and longest duration of sunlight. (Author conclusion modified)##

02832

R. E. Newell, H. W. Brandli, and D. A. Widen

CONCENTRATION OF OZONE IN SURFACE AIR OVER GREATER BOSTON IN 1965. J. Appl. Meteorol. 5, (5) 740-1, Oct. 1966.

One of the conclusions of an investigator studying the global ozone was that further systematic measurements of surface ozone at a number of sites over the globe would be of great value in consideration of stratospherictropospheric exchange processes. Objections were raised to a proposed network of surface ozone stations because measurements made near a city can be contaminated with ozone produced locally by the action of sunlight on automobile and industrial exhausts. The gross results of a one-year period of monitoring surface ozone in the relatively well-ventilated region of Greater Boston, are considered with respect to the general circulation of ozone in the atmosphere and its possible use as a tracer of the vertical transfer of energy from the troposphere to the stratosphere. At present pollution levels, ozone of stratospheric origin can be monitored in a reasonably well-ventilated city. The proposed network, therefore, seems quite feasible. These observations will continue for several years.##

02840

G. B. Welsh and T. E. Kreichelt

CLEAN AIR FOR CHATTANOOGA. Public Health Service, Atlanta, Ga., (Region IV) and Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. July 1964, 77 pp.

The results of limited investigations, based on air quality data obtained during a 30-day sampling period, other available air quality data, evaluation of existing information related to the air pollution problem and a review of the present air pollution control program are presented. Of primary concern in Chattanooga are improper combustion of coal and fuel oil, particulate materials, odors, and fly ash. The sources are industrial, domestic, solid waste and open burning, and motor vehicles. Local meteorological and topographical factors contribute to the accumulation of air pollution in Chattanooga. Low-level inversions occur frequently (about 35 percent of the total hours per year). Although Chattanooga has had a smoke abatement program since 1935 and some progress has been made, there is an apparent need for a more comprehensive air pollution control program.##

03001

THE AUCKLAND AIR POLLUTION RESEARCH COMMITTEE (SEVENTH ANNUAL REPT. FOR YEAR ENDING MAR. 31, 1966.) Auckland Air Pollution Research Committee, New Zealand. 33 pp., 1966

The conclusion of the fourth annual survey in Auckland, New Zealand, is that no significant increases in air pollution have occurred in the last year. The specific areas of consideration are: (1) smoke levels, (2) odors, and (3) pollution by motor vehicles. The report reflects an increased awareness by the public of the air pollution problem and is exemplified by the adoption of smoke regulations.##

03004

J.M. Brown F.D. Maddox

AN APPRAISAL OF THE AIR RESOURCE OF METROPOLITAN BALTIMORE. Maryland State Dept. of Health, Baltimore and Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. (Rept. No. A65-33.) June 1965. 111 pp.

Report includes a discussion of the topographical characteristics of the Baltimore, Maryland area and a review of past data on air pollution control and air pollution potential. Recommendations for a comprehensive study leading to an air resource management program are presented. Specific topics in the report (as they relate to the Baltimore metropolitan area) are these: (1) present pollution levels, (2) sources of air pollution, industrial and non-industrial sources, (3) meteorological aspects of air pollution, and (4) the administration of a future control program.##

03024

SUMMARY OF DATA FROM THE CONTINUOUS AIR MONITORING PROGRAM. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. Oct. 1965. 16 pp.

This report contains data gathered furing 1962, 1963, and 1964, with the data from 1964 presented more extensively than data from the earlier years. The annual average concentrations, the maximum and minimum monthly average concentration, and the maximum daily concentration of the several pollutants monitored are summarized. The minimum daily average concentration was, in each case, below the minimum concentration detectable by the instruments. The following summaries are contained in tables: 1964 average and maximum pollutant levels in greater detail for the several cities. Relative cumulatively frequency distributions for 1964 of basic CAMP data recoreded at 5-minute intervals, and similar distribution of data for 1962 and 1963. These frequency distributions permit the ready determination of the concentration that was exceeded only 5 percent of the time, the median concentration. Total oxidant data for 1964 in the form of the number and percent of day when the maximum hourly total oxidant concentration equalled or exceeded 0.15, 0.10 and 0.05 ppm, and the average and maximum soiling index levels for 1964.##

03027

J. D. Williams, F. D. Maddox, T. O. Harris, C. M. Copeley, Jr., and W. Vand Dokkenburg, Jr.

INTERSTATE AIR POLLUTION STUDY PHASE II PROJECT REPORT. VI. EFFECTS OF AIR POLLUTION. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control 66 pp., Dec. 1966

The Air Quality Goals Subcommittee, appointed under provisions of item 5-A-5 of the Interstate Air Pollution Study Phase II Project Agreement, reviewed literature, met with consultants in the air pollution effects field, and selected air quality goals for consideration by the Project Executive Committee. The Committee limited its consideration to goals because it does not have authority to adopt air quality standards, a function restricted to legally constituted governmental agencies. The Committee does, however, by approving this report, accept the consensus of professional and technical personnel. The explanations of effect levels presented herein were prepared by the staff of the Public Health Service Technical Assistance Branch who utilized the advisory resources available within the Division of Air Pollution. The effects of air pollution as a program element, is only one part of an air resources management program. Air pollution effects, air-quality levels, and pollutant emissions are the major program elements that provide the basis for air quality goals. Actually, if no consideration were given to the length of time needed to reach goals or to the priorities of community needs, air pollution effects would be the only program element to be considered in establishing goals. Suggested goals are listed and are based on the air quality (indicating major types and amounts of pollutants present) as well as actual and anticipated effects of air pollutants in the Interstate Air Pollution Study area. The effects of air pollution have been considered in this report from the viewpoint of a consultant whose task has been the development of a set of goals that will meet the future need of the area. Some of the quantitative relationships between effects and air quality levels have not yet been established, but enough is known that a guide for a constructive air resource management program has been provided for the Interstate Air Pollution Study area. This guide is intended to serve the needs of the study area only, and is not intended to have general application.**

03104

H.C. Wohlers M. Feldstein

INVESTIGATION TO DETERMINE THE POSSIBLE NEED FOR A REGULATION ON ORGANIC COMPOUND EMISSIONS FROM STATIONARY SOURCES IN THE SAN FRANCISCO BAY AREA. J. Air Pollution Control Assoc. 15, (5) 226-9, May 1965.

On the basis of evidence presented, it is concluded that photochemical smog is a major air pollution problem in the San

Francisco Bay Area. Attempts should be made to reduce the intensity of photochemical smog effects by controlling the emission of organic compounds to the atmosphere. In order to reduce the intensity of photochemical smog effects in the Bay Area, it is estimated that an 80 percent total reduction of organic material emitted to the atmosphere is necessary. The nitrogen oxide problem needs clarification. Because of the complexity of the photochemical smog reaction in open atmospheres, technical answers to all phases of the problem are not available.##

03406

R. L. Mecham, J. S. Ameen, R. W. Slater, Jr.

A PILOT STUDY OF AIR QUALITY IN WINSTON-SALEM, NORTH CAROLINA (NOV. 28 - DEC. 5, 1962). Public Health Service, Cincinnati, Ohio, Division of Air Pollution; North Carolina State Board of Health; and Forsyth County Health Dept., N.C. Apr. 1963. 29 pp.
HEW

A one-week pilot study covering a limited number of pollutants at a single location is reported for a short period of the year during which the wind speeds were two to three times the normal values for the season. Such abnormal wind conditions had a considerable effect on the results of the study. Even under these favorable conditions for dispersion of pollutants, high soiling index values were observed. Oxidant concentrations indicated the possibility that photochemical smog may be a problem. Infrequent peak concentrations of sulfur dioxide indicated that it may be a possible probelm source. Recommendations made were based on the data collected in this one-week sampling study and other available data. There are figures on the variation of gaseous pollutants and soiling index, and tables on measurement of carbon monoxide, hydrogen sulfide, oxidants, nitrogen oxides, nitrogen dioxide, sulfur dioxide and soiling index.##

03407

Q. M. Mees R. L. Wortman

PRELIMINARY REPORT AIR POLLUTION SURVEILLANCE STUDY, TUCSON, ARIZONA. Arizona Univ., Tucson, Coll. of Engineering. (Engineering Experiment Station Bulletin No. 13, Civil Engineering Series No. 6.) Aug. 1960. 64 pp.

A study of recent population figures as well as prevailing meteorological conditions in the Tucson area provides ample evidence that these conditions are prevalent. Visual evidence of the growing problem becomes obvious when viewing the Tuscon valley from vantage points provided by the surrounding mountain ranges. In order to attempt an evaluation of the problem as well as provide basic data for future studies of a comparative nature, it was decided that a jointly sponsored project be proposed to extend over a ten-month

period beginning in September, 1959. In addition to providing surveillance data, the program was to serve both research and instructional purposes in Sanitary Engineering at The University of Arizona. The U.S.P.H.S., through its Region IX office, and the Arizona State Health Department were to cooperate by rpoviding technical consultation, some air pollution equipment loans, and certain manpower assists. The project was to be conducted within the framework of the Engineering Experiment Station of The University of Arizona. The period of sampling extended from September 10, 1959 through June 14, 1960 During the regular sampling days throughout the sampling period, observations were made for oxidants, nitrogen dioxide, nitric oxide, sulfur dioxide, carbon dioxide, and particulate matter. The period of testing extended from 7 A.M. through 5 P.M. Beginning January 1, 1960, the U. S. Public Health Service established a National Air Sampling Network Station at The University of Arizona. Operation of this station involves collecting a 24-hour High Volume air sample twice a month and sending it to the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, for analysis. Although the gaseous pollutant levels could not be considered as high levels of pollution when compared to a city such as Los Angeles, it should be pointed out that the population of Los Angeles is approximately twenty times that of Tuscon. Data from the U.S. Public Health Service's National Air Sampling Network (an average of 141 cities) over the two-year period of 1957 and 1958 showed an average pollution of 130 micrograms per cubic meter for the Tucson area for the subject sampling period. Oxidant concentrations compared very favorably with other cities.##

03809

G. J. Raschka

AN APPRAISAL OF AIR POLLUTION IN MINNESOTA. Minnesota Dept. of Health, Minneapolis, (In cooperation with the Public Health Service.) Jan. 1961. 78 pp.

This appraisal of the air pollution situation in Minnesota arose from a growing concern about air pollution problems in the state. Increasing requests for information and assistance registered with the State Department of Health Service were obtained concerning methods of conducting a survey which would establish the nature and extent of the air pollution problem in the state and indicate what activity is needed on the part of the state and local governments in meeting the problem. Data used in preparing this report were obtained by interviews, direct observation, questionnaires, limited air sampling, and review of existing information. The appraisal was made from October 1959 to July 1960.##

03426

E. C. Tabor, J. E. Meeker, and J. M. Leavitt.

AIR POLLUTION IN ST. BERNARD, OHIO. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, 1958. 17 pp.
HEW

An area survey was conducted in St. Bernard, Ohio. It was determined that the levels of suspended particulates and crude organics were considerably higher than that in downtown Cincinnati for the same days. The average levels of 270 micrograms of suspended particulate per cubic meter of air and 65.5 micrograms of crude organics per cubic meter of air were somewhat higher than for other communities of size comparable to St. Bernard. Nitrate and sulfate concentrations also were slightly higher. The highest levels of sulfur dioxide, while not high enough to be of great concern, were associated with northerly winds. On several occasions the level of oxides of nitrogen was high enough to be detectable by the odor. The large amount of aliphatic hydrocarbons in the organic matter was very unusual. It was considerably higher than that from any other community in the United States for which similar measurements have been reported. The soiling power of the air was higher when the wind blew from the North.##

03433

F. A. Bell, Jr., G. Bisel, Jr., T. N. Hushover, L. B. Perry, P. J. Schuette, and E. Vihman.

FRESNO AIR POLLUTION STUDY. Public Health Service, Washington, D. C., Div. of Air Pollution; California State Dept. of Public Health, Berkeley; and Fresno County Health Dept., Calif. July 1960. 25 pp.
HEW

Haze and other air pollution effects have occurred in the Central Valley of California. In order to answer questions regarding present pollution levels and to estimate the future pollution potential of an area which is just beginning to experience air pollution, Fresno was selected as a representative growing metropolitan area of the Central Valley. Air pollution concentration levels together with visibility reduction measurements and subjective observations indicate that photochemical smog occurs in the Fresno area. The Fresno rural station in Kerney Park had AISI particulate matter results which were in general higher than the results at the Fresno city station. AISI particulate matter results indicate that episodes of air pollution occur widely throughout the Valley. Comparisons of average results from stations at Feesno, at Kearney Park, Sacramento, Stockton and Bakersfield show that the AISI results were two to four times higher for the December 3-9 period than for the September 10-17 period for all stations. An estimate of pollutants being emitted to the atmosphere indicates that motor vehicles are the main and most significant sources of smog-forming raw materials in the Fresno area.##

03434

F. A. Bell, Jr., W. J. Beck, J. H. Shrimp, and G. B. Welsh.

A PILOT STUDY OF AIR POLLUTION IN WASHINGTON, D.C. Public Health Service, Washington, D.C., Div. of Air Pollution. Dec. 8, 1960. 19 pp.
HEW

The study covered seven days, including one weekend, and one all-night sampling period for intensive air pollution sampling. The period covered was December 2 through December 8, 1960, from 9:00 AM to 5:00 PM. The all-night sampling period covered 9:00 AM, December 5 through 9:00 AM, Demember 6. The gas and particulate pollutants under test were selected to be indicative of the general air pollution of the area. Oxidant, nitrogen dioxide, nitric oxide, carbon monoxide, smoke and particulate were sampled. Visibility measurements to ground level objects were taken every hour. The roof of the seven-story District of Columiba Municipal Center Building, 300 Indiana Avenue, N.W., was selected as the sampling site. The following equipment was used in the study: Multiple gas sampling apparatus; High volume particulate sampler; AISI automatic smoke sampler; and Sepctronic "20" analyzer.##

03441

CLEAN AIR FOR CALIFORNIA (INITIAL REPORT OF THE AIR POLLUTION STUDY PROJECT, CALIFORNIA STATE DEPT. OF PUBLIC HEALTH). California State Dept. of Public Health, San Francisco. Mar. 1955. 60 pp.

This is an early survey report of the air pollution situation in California. The body of knowledge, available at that time, on the growing problems of polluted air is discussed and a plan for action outlined. Attention is focussed on the air pollution problem in the Los Angeles area, where eye irritation, plant damage and other harmful effects, such as discomfort, decreased visibility and nuisance occur most frequently. Recommendations to State and local Governmental authorities, to universities and other research organizations, to the industry and public are made.#

03453

POLLUTION OF THE ATMOSPHERE IN THE DETROIT RIVER AREA. International Joint Commission, Detroit River Area, Air Pollution. 1960. 273 pp.

The air is being polluted on both sides of the international boundary to an extent that is detrimental to the general welfare of

the citizens in communities along the Detroit River and to property interests. Vessels plying the waters of the Detroit River, particularly the hand-fired coal-burning vessels, contribute seriously to pollution of the air over, and in the vicinity of, the cities of Detroit and Windsor and other communities along the river on both sides. Industrial, domestic and transportation activities on land contribute to the overall pollution of the air to a much greater extent than vessels plying the river if consideration is given only to average pollution levels over the entire study area. Continued surveillance should be maintained and some form of continuing regulation should be enforced to ensure that there is no appreciable lapse in the performance achieved under the voluntary control program. For vessels of sufficient cargo-carrying capacity, the costs of conversion to either automatic stoking or oil firing would be repaid within a reasonable number of years. At an average cost of about $85,000 per vessel, the above conversion program for 200 vessels would entail a total expenditure of about $15,000,000. For the larger hand-fired vessels, there are insufficient resources available in equipment and manufacturing facilities to meet the problem of the immediate conversion of large numbers of hand-fired vessels to more modern firing methods; a reasonable time period should be allowed for the installation of such equipment. The costs of the remedial measures necessary for abatement of air pollution from vessels should be borne solely by the owners of such vessels.##

03454

W. C. Cope, Chairman.

SMOKE AND AIR POLLUTION - NEW YORK - NEW JERSEY. Interstate Sanitation Commission, New York City. Feb. 1958, 95 pp.

Pollution in the metropolitan area was studied by: aerial reconnaissances and photography; and surveys in the communities. Significant information was collected on: relationships of meteorology, visibility and pollution; interstate movement of pollution as indicated by releasing tracer dust in one state and collecting in the other; amount of vehicle exhaust fumes and other organic materials in the air; sulfur dioxide concentration on Staten Island, and ozone on Staten Island and in Carteret, N.J.; effects of the polluted atmosphere on health, vegetation, materials and transportation; and a study and evaluation was made of existing laws in the State of New York, New Jersey and Connecticut, and other jurisdictions. Air pollution originating in regions of New York and New Jersey within the New York Metropolitan Area is interstate in character, affects public health and comfort adversely, and damages property. While the control and abatement of air pollution at its sources is the primary obligation of the states, counties or municipalities in which it originates, the problems of interstate air pollution cannot be solved wholly by governmental agencies independently of one another. The abatement of existing interstate air pollution and the control of future interstate air pollution is of prime importance to the persons living and industry located in the area affected thereby, and can best be accomplished through the cooperation of the states involved, by and through a

common agency or instrumentality. An interstate instrumentality, employing the administrative practices followed by the Interstate Sanitation Commission in the abatement of interstate water pollution, should be created to deal with the problems of interstate air pollution. Drafts of proposed legislation to meet the situation described in this report should reflect fully the opinions and needs of many agencies, local governing bodies, members of the Legislatures, representatives of industry, and of the public. There has been insufficient time between the completion of the study and the submission of this report to afford opportunity to interested agencies to express their views on the form which legislation to abate interstate air pollution should take.##

03458

D. M. Keagy and J. J. Schueneman

AIR POLLUTION IN THE BIRMINGTON, ALABAMA, AREA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. (Rept. No. A58-8.) May 1958. 80 pp.
HEW: A58-8

The purposes of this survey were to: (1.) Review the existing and potential air pollution situations. (2.) Review existing air pollution control activities; and (3.) Develop recommendations for organization, staff, facilities, program, and legislation relative to air pollution control activities. The scope of the study was limited to consideration of available information relative to air pollution including: types of activity which cause pollution, evidences of pollution levels, meteorological and topographical influences on the dispersion of pollutants, existing or authorized governmental activity for control of air pollution, and other relevant community characteristics. The study area was the boundary of Jefferson County.##

03462

E. E. Lemke, N. R. Shaffer, and J. A. Verssen

SUMMARY OF AIR POLLUTION DATA FOR LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif., Engineering Div.

Emission concentrations of pollutants for Los Angeles, California are given. The levels cited are a result of the Board of Supervisors of Los Angeles giving the authority to the Air Pollution Control District - County of Los Angeles. Also included are sixty-two (62) industrial control programs started in the Los Angeles area, along with the dates installed and the cost.##

03466

R. P. Lewis, S. B. McKee, F. A. Bell, Jr., and H. S. Carter

AIR POLLUTION IN GEORGIA. Georgia State Dept. of Public Health, Atlanta, Industrial Hygiene Service; Public Health Service, Cincinnati, Ohio, Div. of Air Pollution; April 962. 35 pp.
CFSTI: PB 168 312

During recent years air pollution has come to the forefront nationally as a major problem of man's environment because of its nuisance, property damage and other effects, and because of its potential injury to health. In 1959 a survey of industrial air pollution in Georgia, carried out by the Georgia Department of Public Health, showed the existence of a number of significant air pollution problems due to emissions from industrial plants. Emission of air pollutants has been increasing in Georgia from a variety of sources including automotive vehicles, burning refuse dumps, home and commercial heating plants and other sources, in addition to industrial sources. These increased emissions have resulted in a mounting number of air pollution problems. Therefore, a Statewide survey was undertaken to provide a current assessment of air pollution in Georgia and to develop recommendations for necessary action.##

03468

M. D. High, R. W. Slater, and G. G. Costantino

A PILOT STUDY OF AIR POLLUTION IN PROVIDENCE, RHODE ISLAND. Public Health Service, Cincinnati, Ohio, Robert A. Taft Engineering Center. (Rept. No. A62-15.) June 1962. 49 pp.
HEW: A62-15

This study covered two equal periods of 15 sampling days each. Samples were collected for determination of sulfur dioxide, nitric oxide, nitrogen dioxide, carbon monoxide, and total oxidants, on a bi-hourly basis. Visibility from the sampling site was determined on the same schedule; photographs were taken to document visibility restrictions. Particulate pollution levels were monitored continuously in three ways. Soiling index was determined with the AISI strip filter paper sampler with a 4-hour sampling time; suspended particulates were collected on a 24-hour basis for determination of total weight; and a single dustfall sample was collected over the entire period of each phase of the study. Methods of measurement are described in the appendix, and the primary sources of pollutants are listed.##

03505

M. D. Hornedo and J. H. Tillman

AIR POLLUTION IN THE EL PASO, TEXAS AREA. El Paso City - County Health Unit, Texas. 1959. 104 pp.

The primary purpose of this study was to obtain basic scientific air pollution data concerning the type, extent, source, and effect of the waste from industry and other air pollution in the El Paso area. Another purpose was to determine the need and nature of a permanent air pollution control program. The scope of the program was limited by two factors; the gathering of those samples which were within our means to analyze and the collection of pollutants commonly found in any city.##

03511

AIR MONITORING AND SAMPLING NETWORKS (PROCEEDINGS OF THE 1959 SEMINAR). Public Health Service, Cincinnati, Ohio, Div of Air Pollution. (Rept. A60-3.). 1960. 143 pp.
HEW: A60-3

The objective of the seminar was to exchange views among people engaged in the operation of air sampling and monitoring networks for the purpose of gaining information on the objectives, organization, operation of networks, and the analysis and utilization of data obtained from their operation. Specific topics revieved are: (1) state and local networks, (2) selection of sampling sites, (3) equipping sampling stations, (4) laboratory support needed, and (5) interchange and release of data.##

03512

G. B. Welsh

AN APPRAISAL OF AIR POLLUTION IN SPARTANBURG, SOUTH CAROLINA (A COOPERATIVE STUDY BY THE CITY OF SPARTANBURG, SOUTH CAROLINA, THE SOUTH CAROLINA STATE BOARD OF HEALTH AND THE PUBLIC HEALTH SERVICE). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. Apr. 1962. 49 pp.

The purpose of the study was to make a preliminary general evaluation of the air pollution problem and to outline general recommendations for the guidance of local officials in meeting existing and future air pollution problems. The scope of the study was limited to consideration of various factors affecting air pollution levels and a review of those activities which contribute pollution to the community atmosphere. In addition, a seven-day air pollution measurement study was conducted to obtain an initial indication of gaseous and particulate pollution levels and to help define the nature and extent of air pollution in Spartanburg. This report is a preliminary appraisal of air pollution problems in the Spartanburg area.##

03513

A PILOT STUDY OF AIR POLLUTION IN LYNCHBURG, VIRGINIA. Public Health Service, Washington, D.C. and City of Lynchburg, Va. Feb. 1961. 25 pp.

Results of a one-week air pollution survey in Lynchburg, Virginia, revealed the following: 1. The levels found give a clear indication that Lynchburg has an air pollution problem. 2. The levels found for soiling capacity and particulate matter indicate the presence of a general smoke problem. 3. The visibility standard for ambient air of the California State Health Department (less than three miles at less than 70 percent relative humidity) was exceeded on six days, another indication of high particulate levels and smoke. 4. A combination of meteorological conditions, including low wind speed, temperature inversion, and a haze layer at the top rim of the James River Valley were noted on February 15. The highest levels of general air pollution for the entire sampling period occurred during this period and appear to be attributable to the combined meteorological conditions. 5. The high level of sulfur dioxide is comparable to levels found in many large population centers or highly industrialized areas. The levels for some of the gaseous pollutants are about average for urban areas; however, under conditions of low wind speed and temperature inversion, they may accumulate until much higher levels are reached.##

03701

J. Cholak, L. J. Schafer, W. J. Younker, and D. W. Yeager

THE RELATIONSHIP BETWEEN SULFUR DIOXIDE AND PARTICULATE MATTER IN THE ATMOSPHERE. Am. Ind. Hyg. Assoc. J. 19, (5) 371-7, Oct. 1958. (Presented at the 19th Annual Meeting, American Industrial Hygiene Association, Atlantic City, N.J., Apr. 24, 1958.)

The purpose of this aerometric survey was to study the relationship between the selected pollutants in the natural photochemical formation of the oxidant type smog. This paper describes the features and the patterns of occurrence of particulate matter and sulfur dioxide as observed in Cincinnati since 1946. The findings obtained in the survey permit interesting comparisons with those obtained in earlier surveys.##

03714

J. Cholak and L. J. Schafer

THE CONCENTRATIONS OF OXIDANT (OZONE) AND NITROGEN DIOXIDE IN THE AIR OF CINCINNATI, OHIO. Am. Ind. Hyg. Assoc. J. 21, 452-8, Dec., 1960. (Presented at the 21st Annual Meeting, American Industrial Hygiene Association, Rochester, N.Y., Apr. 25-28, 1960.)

The purpose of this paper is to describe observations concerning the concentrations of oxidant, nitrogen dioxide and nitric oxide. The frequencies of the occurrence of certain average hourly concentrations of oxidant and nitrogen dioxide in the air at the three stations and of nitric oxide at the Avondale station are illustrated graphically. Higher concentrations of oxidant were

found in the Avondale section of the city. Values in excess of 1 pphm occurred 50% of the time at the Avondale station, 38% of the time at the perimeter residential station (French Park) and only 26% of the time at the downtown station. An average hourly concentration in excess of 10 pphm was never reached at the downtown station and occurred only 0.01 and 0.05% of the time at the French Park and Avondale stations respectively. The order of rank of the three stations with respect to the levels of concentration of nitrogen dioxide differed from that shown by the oxidant. The levels of concentration were higher in the downtown area, and decreased in the air at the two residential areas in accordance with their distance from the central core area of the city. Concentrations of nitrogen dioxide, averaging less than 1 pphm per hour were found 44% of the time at the French Park area, 14% of the time at the Avondale station and only 2% of the time at the downtown station. Data on nitric oxide were collected for several months during 1958 and 1959 only at the Avondale station. These data indicate that the average hourly concentration in Avondale was less than 1 pphm for 84% of the time. Average hourly concentrations in excess of 10 pphm occurred only 0.5% of the time.##

03715

J. Cholak, L. J. Schafer, D. Yeager, and W. J. Younker

GASEOUS CONTAMINANTS IN THE ATMOSPHERE. A.M.A. Arch. Ind. Health 15, 198-206, Mar. 1957. (Presented at the Air Pollution Symposium, 130th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 17-21, 1956.)

This paper deals with the concentrations of oxidant, nitrogen dioxide, sulfur dioxide, and carbon monoxide found in the air in the course of prolonged tests during three seasons of the year. The concentration of sulfur dioxide in the air of Cincinnati varied with the season. It was lowest during the summer when the combustion of solid fuel was at a minimum. The level of concentration of oxidant as recorded by the potassium iodide recorder varied inversely with the concentration of the sulfur dioxide present. The highest levels of concentration were found during the summer season. The oxidant usually reached its maximum value during the afternoon and was lowest during the night. The concentration of oxidant in the atmosphere of Cincinnati ranged between 0.2 pphm and 6 pphm. The diurnal fluctuation in the concentrations of nitrogen dioxide indicated that the concentrations were generally higher at night than during the daytime. The lowest levels of concentration were found during periods when the oxidant reached its highest value. The levels of concentration of nitrogen dioxide ranged between 0.2 and 9.5 pphm. The concentration of carbon monoxide in the air during all three periods was very near the limit of detection of the method employed, being below 1 ppm generally.##

03725

C. R. Hosler

NATURAL RADIOACTIVITY (RADON-222) AND AIR POLLUTION MEASUREMENTS IN WASHINGTON, D. C. J. Appl. Meteorol. 5, (5) 653-62, Oct. 1966.

Atmospheric concentrations of radon (Rn222) were measured at urban, suburban and rural sites in the Washington, D.C., metropolitan area during a stagnant weather regime in mid August 1965. An analysis of air quality data, radon concentrations and meteorology indicates that the stagnant weather conditions which lead to the accumulation of smoke, haze and gaseous pollutants in the air, are conducive to the accumulation of radon in the lower atmosphere. During maximum stagnation radon concentrations were 2-4 times higher than normal; the high levels of natural radioactivity reflect the limited volume of air available for dilution, caused by a restriction to vertical mixing that prevailed throughout the stagnant period. This case study suggests that high concentrations of natural radioactivity will be indicative of air pollution potential conditions existing in the atmosphere. Also, air quality data indicated that heavy rains and vigorous mixing associated with a squall line were ineffective in cleansing or displacing, for a significant length of time, the polluted air mass. (Author abstract)##

03863

A. L. Chaney

INVESTIGATIONS TO DETECT THE ATMOSPHERIC CONVERSION OF SULFUR DIOXIDE TO SULFUR TRIOXIDE. Proc. Am. Petrol. Inst., Sect. III. 38, 306-12, 1958. (Presented at the 23rd Midyear Meeting, American Petroleum Inst. Division of Refining Los Angeles, Calif., May 15, 1958.)

In the gaseous state, the sulfur dioxide is only very slowly oxidized to sulfur trioxide. It has been suggested that in the presenece of fog and particulate-matter catalysts, this oxidation may be greatly accelerated. If oxidation does occur, both sulfate and acidity of the partiulate matter should increase. Because nitrate is frequently also present in significant quantities, its relationship to acidity should also be known. Techniques have been developed for testing this hypothesis in the Los Angeles area. Particulate matter was collected and weighed in two separate fractions based on particle size, and aqueous extracts of it were prepared for determination of acidity, sulfate, and nitrate. Larger particles were collected by dry impingement and the submicron size by filtration through membrane filters. Fog droplets, if present, would be in the first fraction. Simultaneous sampling for sulfur dioxide concentration was carried out by a highly sensitive and specific procedure. The sampling period was one hour, and provision was made for automatic collection of several successive

samples at intervals throughtout a 24-hour period. These samples were sufficient in size for measurement of both total weight and weight of the water-soluble fraction. Chemical determinations in the microgram range were utilized for the sulfate, nitrate, and acidity measurements. The sulfur dioxide was usually very low in concentration and was not well correlated with sulfate level. Other sources besides sulfur dioxide may be required to account for the sulfate levels found in the particulate matter. A large fraction of the particulate matter was found to be water soluble, particularly in the submicron fraction, and it contained acidity which could not be accounted for in terms of the sulfate and nitrate levels found. (Author abstract modified) **

04173

G. P. Gushchin, I. I. Romashkina, and O. N. Chemyakina

SOVIET STATION DATA ON TOTAL ATMOSPHERIC OZONE FOR 1963. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part II - Atmospheric Ozone. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp. 235-75. 1965. Russ. (Tr.)
CFSTI: TT 6662191

Total atmospheric ozone data recorded by 24 Soviet stations during 1963 are listed in tables, consisting of observation data, number of observations, and total ozone. Vibrations in the aerosol layer still affect ozone measurement results. The results were obtained in direct sunlight. Data were obtained with the universal ozonometer, and with the Dobson spectrophotometer. **

04325

F. L. Meadows, J. J. Henderson, and C. B. Robison

AIR POLLUTION PATTERNS IN SIXTEEN ALABAMA CITIES. Preprint. 1967.

In 1962, the Alabama Respiratory Disease and Air Pollution Study was initiated to determine the prevalence of various pulmonary disorders and to relate these findings with air quality data. This paper describes part of the aerometric effort begun in October 1962 in 16 Alabama cities. Samples for analysis of suspended particulate, dustfall, sulfation, and 24-hour gases (nitrogen dioxide and sulfur dioxide) were collected routinely from 28 stations in the 16 cities. The study is described and statistical procedures are discussed. Air quality results are presented with emphasis on spatial and temporal differences between cities in the study and comparisons are made with other studies. Tables and diagrams give details on the 16 cities surveyed. (Author abstract modified) **

04348

L. A. Pipperton

OZONE AND OZONE PRECURSORS IN THE ATMOSPHERE OF CHAPEL HILL, NORTH CAROLINA. J. Geophys. Res. 70, (20) 5009-15, Oct. 15, 1965. (Presented at the International Atmospheric Ozone Symposium, Albuquerque, N. Mex., Aug. 31-Sept. 4, 1964.)

Seventeen continuous 24-hour samples of ozone were obtained in the community air of Chapel Hill, N.C. The readings were made over the period of a year with a Mast ozone meter. The over-all range was 0.0 to 13.0 ppha. The daily ranges varied from 0.0-0.1 to 6.4-13.0. Atmospheric sampling for a number of pollutants revealed the fact that the air of Chapel Hill was intermediate in cleanliness between rural and urban air. Ambient air was captured in three different systems, two glass and one Mylar, and irradiated with artificial light or sunlight. Of 29 samples, irradiation caused an apparent ozone synthesis in 25. Four of these cases were confirmed with a Regener oxyluminescent ozone meter. Of the 21 increases measured with the Mast ozone meter alone, 9 were greater than 1.2 ppha. The differential of 1.2 ppha was established as the confidence level of the Mast instrument by evaluation in this laboratory.##

04546

A. Turk C. J. D'Angio

COMPOSITION OF NATURAL FRESH AIR. J. Air Pollution Control Assoc. 12, (1) 29-33, Jan. 1962. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

Certain outdoor atmospheres considered to be pleasant are usually referred to as "fresh". In an effort to determine the specific components responsible for the sensory effect of "freshness", the present investigation was undertaken. The organic vapor content of three typically "fresh" atmospheres, mountain, forest and seashore, was analyzed. The forest and seashore atmospheres were chemically characterized by the presence of aromatic ethers, and some unsaturated material. The mountain atmosphere was found to be too low in concentration of organic matter to be analyzed. The method of sampling and analysis described lends itself to applications in meteorological surveys.##

04562

K. Kawamura and S. Sakurai

THE CONTENT OF THE ATMOSPHERIC NITROGEN DIOXIDE IN THE SUBURB OF TOKYO. Meteorol. Geophys. 14, (3-4) 214-24, Dec. 1963.

The concentration of NO2 in the ambient air was observed at the western suburb of Tokyo for the period from September 1960 to August 1961, using an automatic gas sampler. The results of determination revealed that NO2 concentration showed a marked diurnal variation in winter with two maxima respectively at about 3 hours after sunrise and at about 2 hours after sunset, and two minima respectively at sunrise and in the afternoon. The time of occurrence of the afternoon minimum varied greatly day to day, while those of the dawn minimum and of the evening maximum did not change greatly, falling on most of days within the range of plus and minus one hour from the monthly average. The morning peak was always lower than that in the evening and no morning maximum was observed often in summer as well as on windy days in other seasons. The monthly mean concentration of NO2 at night was higher than that at day and the maximum values of 78 and 54 micrograms NO2/cu m were observed in December respectively. The diurnal variation in NO2 seems to be attributable to the combination of meteorological conditions and photochemical effect. (Author abstract)##

04616

J. E. Dickinson

AIR QUALITY OF LOS ANGELES COUNTY (TECHNICAL PROGRESS REPORT - VOLUME II). Los Angeles County Air Pollution Control District, Calif. Feb. 1961. 306 pp.

Volume II of the Technical Progress Report is concerned with chronicling the air monitoring program of the Los Angeles County Air Pollution Control District between 1951 and 1959. Topics covered include: Chemistry of the Atmosphere; Air Monitoring; Evaluation of Smog Effects Data; Estimation of Total Air Pollution in Los Angeles County; Utilization and Analyses of Total Air Pollution Data. Without the data accumulated as the result of the sampling programs of 1951-57 it would not have been possible to discover the unique problems involved with Los Angeles smog and to determine what kind of control measures would be needed to abate them. Thus, it was possible (1) to identify in the atmosphere the contaminants considered to be the most important with regard to photochemical smog formation theory; (2) to establish their approximate concentration ranges; (3) to confirm theories of photochemical smog formation and transport; and (4) to define the areas of the Basin most severely affected by smog and the areas in which most of the contaminant sources were concentrated. Correlation between meteorological trends and smog occurrence, without radical change in emission concentrations, indicate the importance of weather conditions to smog occurrence.##

04651

B. T. Commins R. E. Waller

OBSERVATIONS FROM A TEN-YEAR-STUDY OF POLLUTION AT A SITE IN THE CITY OF LONDON. Atmos. Environ. 1, (1) 49-68, Jan. 1967.

As part of an extensive study of the effects of air pollution on health, measurements of pollution have been made at a site in London for more than ten years. The results of daily measurements of the concentration of smoke and sulfur dioxide made throughout that period and of more frequent measurements made during episodes of high pollution are reported. These show a reduction in the annual mean and peak concentrations pf smoke during the ten year period, but there have not been any significant changes in the concentrations of sulfur dioxide. Occasional measurements of a wide range of other pollutants are also reported and results from a series of measurements of polycyclic aromatic hydrocarbons indicate a decline in the concentration of this potentially carcinogenic component of pollution in London. (Author abstract modified) ##

04834

New York State Air Pollution Control Board, Albany. 1965. 15 pp.

AIR POLLUTION/CHEMUNG COUNTY (SUPPLEMENT TO COMPREHENSIVE AREA SURVEY REPORT NUMBER ONE (GREATER ELMIRA).

Since the degree of air pollution is low in this rural portion of Chemung County, proper steps would be taken to insure continuing low levels of air contaminants. All new sources of air pollution can be controlled by adherence to rules and regulations promulgated by the New York State Air Pollution Control Board in 1962. Local officials, in cooperation with the Board, can insure new sources or modifications to existing sources and meet minimum requirements as established by the Board. Rules and regulations for this area should be made at the same time as those for Greater Elmira, using ambient air quality objectives as promulgated by the Board. When applying the ambient air quality objectives, both the present survey area and Greater Elmira should be classified as one region. In this manner, all of Chemung County may have a uniform set of rules and regulations at the same time. Refuse disposal practices should he revieved in each community. Open burning of refuse by private individuals should be prohibited and central collection instigated. Disposal should be properly-operated, sanitary landfills or any other acceptable method. (Author summary) ##

04864

New York State Air Pollution Control Board Albany. 1964. 96 pp.

AIR POLLUTION - NIAGARA COUNTY (COMPREHENSIVE AREA SURVEY Report number three).

The objectives of this study are to define the nature and extent of the air pollution potential in Niagara County so as: (1) To provide information by which rules and regulations can be

established for the control of existing air pollution; (2) To provide technical data needed for implementation of a practical and reasonable air pollution abatement program; (3) To assess the effectiveness of existing controls and determine what steps must be taken by governmental agencies to control both existing and potential air pollution; and (4) To provide background data needed to check the effectiveness of any future control program.##

04996

M. Katz

SOURCES OF POLLUTION. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 95-105

The wind and cloud conditions in the Detroit River area for five years are summarized. Sulfur dioxide was measured by antometers. Hydrogen sulfide, chlorine, oxides of nitrogen, and ammonia were sampled. Suspended particulates were collected. The distribution of dust fall components is tabulated. About twenty metallic elements were identified by x-ray diffraction of suspended particulates. Community health surveys covering morbidity and mortality records and accounting for ethnic and socioeconomic factors are outlined.##

05008

New York State Air Pollution Control Board, Albany. (Feb. 1966.) 132 pp.

AIR POLLUTION/THE MID-HUDSON: GREENE, ULSTER, ROCKLAND, COLUMBIA,DUTCHESS (COMPREHENSIVE AREA SURVEY REPORT NUMBER SIX).

A comprehensive study of the air pollution potential in the Mid-Hudson area was undertaken as a cooperative effort by the Columbia, Dutchess, Rockland, and Ulster County Health Departments, and the State Health Department's Oneonta District Office (for Greene County) and Middletown District Office (for Beacon City). The objective of the study was to define the nature and extent, and causes and effects, of the air pollution potential in the Mid-Hudson area. Both industrial and nonindustrial air pollution were studied by conducting an inventory of possible air contaminant sources and determining contaminant emissions within each county. The inventory was supplemented by an atmospheric sampling network consisting of 41 stations located throughout the five counties.##

05010

New York State Air Pollution Control Board, Albany. (July 1958.) 76 pp.

A REVIEW OF AIR POLLUTION IN NEW YORK STATE.

This report contains current knowledge of air pollution problems affecting New York State. Previous study results are summarized and more important factors influencing air pollution in the state are discussed. The nature and types of air contaminants their effects, and the elements of air pollution legislation are considered. Study areas for future activities of the Air Pollution Control Board and priorities for action are proposed.#

05095

F. A. Bell, Jr., and G. B. Welsh

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS' OXIDANT SAMPLING NETWORK (ANNUAL REPORT OCT. 1961-SEPT. 1962). Public Health Service, Washington, D. C., Division of Air Pollution. (Oct. 25, 1962.) 28 pp.

Photochemical smog, which arises primarily from the action of sunlight on automotive fumes in the atmosphere, has been demonstrated to be a significant problem in the Washington metropolitan area. Without the institution of appropriate automotive or other control measures, increasing population and numbers of automotive vehicles will cause the photochemical smog problem to become progressively more severe. The maximum oxidant level of 0.41 parts per million (ppm), measured at the D.C. Municipal Center Building Station, is about one-third the maximum (phenophthalin oxidant) concentration measured in Los Angeles County, but this cannot be interpreted to mean that photochemical smog in Washington is necessarily one-third as severe as it is in Los Angeles County because of the differences in sampling frequency and analytical procedures. Ten days with an oxidant level of .25 ppm or more, the level at which some eye irritation is noted, were recorded at one or more Network stations during the first years' operation. With the exception of the Prince Georges County Health Department Station, all stations have reported one or more days with oxidant index of .25 ppm or higher. However, on the average th D.C. Municipal Center Building Station appears to have the highest oxidant concentrations. During the first year of operation oxidant levels showed a definite seasonal cycle, low concentrations during cold months, and higher concentrations during warmer months. One or more days of eye irritating levels occurred in May, June, July, August, September, and October but none during the other months of the year. The first years' operation has shown that, given a modest amount of technical assistance and coordination, useful air pollution surveillance data can be gathered for a metropolitan area with a minimum expenditure for manpower time, equipment, and supplies.##

05110

W. J. Hamming, R. D. MacPhee, and J. R. Taylor

CONTAMINANT CONCENTRATIONS IN THE ATMOSPHERE OF LOS ANGELES COUNTY . J. Air Pollution Control Assoc. 10, (1) 7-16, 93, Feb. 1960.

The primary purpose of this study was to analyze long-term pollution trends as measured by the Los Angeles air monitoring network. Except for work in England on a distinctly different type of air pollution problem, there are few data available which span any appreciable number of years. The District's monitoring was accomplished with 24-hr recording devices. Its usefulness is justified primarily as a protection and warning measure. A by-product of this operation is the generation of data from which pollution can be studied. The findings may be summarized as follows: (1) During the three-year period, 1956-59, the general level of CO rose. The rise in CO of one ppm per year was not reconciled with weather or other pollution factors. The rise in NO2 was small and trends are available only from 1957. SO2 varied slightly without changing its general level. Particulates declined during 1956 and 1957 which could have been due in part to the District's incinerator ban. A preliminary study on the basis of comparable weather factors appeared to justify this conclusion. The oxidant, eye irritant, and plant toxicant declined in 1956 and 1957 from a high in 1955, but exhibited a slight upturn in 1958. Winds and inversions appear to the determining factors for trends in eye irritant, oxidant and plant toxicant. (2) In examining the monthly average data used as the basis for the trend lines, it was observed that certain contaminant and weather factors could be grouped together. Monthly averages for primary, or Type I factors exhibited annual peaks in midwinter. These were CO, hydrocarbons, NO2, particulates, SO2 (not perfect fit), frequency of morning surface inversions, and the inverse of 1600-1900 PST windspeeds. In addition, the Type I contaminants are known to yield bimodal diurnal variations. Secondary, or Type II, entities showed annual peaks in the autumn, and single daily peaks. These included aldehydes, eye irritant, oxidant, plant toxicants, ozone alerts, restricted visibility, the frequency of Rule 57 Days, and the inverse of 24-hr average windspeeds. Both the yearly and the diurnal cycles confirm the distinction between Type I and Type II contaminants. (Author conclusions modified) ##

05111

J. Cholak, L. J. Schafer, and D. W. Yeager

THE CONCENTRATION OF OZONE IN THE ATMOSPHERE OF CERTAIN AMERICAN CITIES . J. Air Pollution Control Assoc. 5(4): 227-32, 248 (Feb. 1956). (Presented before a session on smoke and fumes, 20th Midyear Meeting, American Petroleum Inst., Division of St. Louis, Mo., May 10, 1955.)

The previous reported results of the analytical survey for the first year are reviewed and the results of a new continuous long-term investigation in Washington, D. C. are presented. The determination of oxidant in the atmosphere of 10 Eastern and Midwestern American cities by the method used in the Los Angeles area demonstrates that the concentration of oxidant, as so determined and recorded, varies inversely with the concentration of sulfur dioxide present in the atmosphere. The levels of concentration of oxidant were generally so low as not to lend themselves to correlation with meteorologic variables. The photochemical production of ozone which appears to have occurred in

Los Angeles and vicinity could not be confirmed in this investigation. No levels of concentration of oxidant above those which have been recorded as normal in other investigations were observed, except in Charleston, W. Va., during a period of heavy fog. The levels of concentration of the oxides of nitrogen found in these observations bear no demonstrable relationship to the density of motor traffic. Relatively high concentrations of the oxides of nitrogen were observed at times, but their effect on of oxidant, as recorded instrumentally, could not be established with accuracy. The levels of concentration of carbon monoxide in the atmosphere, so far as this was investigated, appeared to vary with the density of motor traffic. The concentration during the day generally reached its peak during the period of maximum traffic, but on other days it remained at a uniform level throughout the day.##

05112

Rogers, L. H.

NITRIC OXIDE AND NITROGEN DIOXIDE IN THE LOS ANGELES ATMOSPHERE. J. Air Pollution Control Assoc. 8(2), 124-8, Aug. 1958. (Presented at the 132nd National Meeting, American Chemical Society, New York City, Sept. 8-13, 1957.)

The objective of the studies reported here was to identify the interrelationships between NO, NO2, OXIDANT AND OXIDANT precursor in the Los Angeles atmosphere. A four-channel instrument was used to monitor the atmosphere, except for the oxidant studies where a different instrument was used. The instrument included a 4-channel Brown strip chart recorder which made successive readings on a special 7-cell colorimeter. The colorimeter provided a means of measuring the reaction from 4 absorbing columns, one for each of the atmospheric components. NO2 was measured after contacting the air with modified Griess reagent; NO plus NO2 was measured by first converting NO to NO2 with a controlled concentration of ozone, and measuring the total NO2 with modified Griess reagent: oxidant was measured with 20% neutral KI; oxidant precursor was measured by first passing the air sample through a 50 l. Pyrex flask irradiated with four mercury arc lights, and then into a contacting column containing 20% neutral KI. Average oxidant precursor showed a greater value than oxidant both day and night, although the maximum was about the same for both components in the middle of the day. Oxidant precursor was distinctly greater during the hours when the sun's intensity diminished, and at night. A minimum was observed at 5 to 6 A. M. The average oxidant-forming power of the atmosphere, as measured by the oxidant precursor values, averaged more than 15 pphm. NO was found to occur at larger concentrations than NO2 during the night, but a reversal occurred during the daylight hours. Moreover, there were two maxima for both components at about 8 A.M. and again about 6 to 10 P.M., with two minima: One in the middle of the day at about 11 A.M. to 2 P.M. and in the early morning at about 4 to 6 A.M. The minimum observed in the middle of the day occurred at the same time as the maximum oxidant value measured. The rough parallelism between No. and NO2 concentrations at night suggests that NO2 is being formed from NO, presumably by the reaction 2NO + O2 yields 2NO2.##

05196

G. B. Bell, and N. E. Waggoner

A FIELD STUDY OF AIR POLLUTION IN THE LOWER SACRAMENTO VALLEY DURING THE 1960 FALL SEASON. California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation and California Univ., Los Angeles, Division of Agricultural Sciences. 72 pp. (Nov. 1961).

The objectives established for this study included: the analysis of Sacramento's photochemical smog episodes during the 1960 fall season for possible relationship to agricultural burning; the comparative evaluation of the particulate matter brought to Sacramento by down-valley winds when significant amounts of agricultural burning occurred and when little or no burning occurred; the measurement of concentrations of oxidant, hydrocarbon, and particulate matter which characterized various pollution events occurring during the 1960 fall season; the documentation of meteorological conditions which prevailed during recognizable pollution events for comparison with similar conditions when little or no agricultural burning occurred; and, the better understanding of the principles involved and interrelationships of agricultural burning and meteorology which combine to produce visible air pollution.##

05200

J. Palomba, Jr.

DENVER METROPOLITAN AREA AIR SAMPLING SURVEY. Colorado State Dept. of Public Health, Denver. Sept. 1961. 28 pp.

The report points out that an air pollution problem exists in the Denver Metropolitan Area in a sufficient degree to merit further intensified action. This report serve as a cornerstone upon which a sound program can be built; this will involve further study and evaluation of the problem, and an adequate control program. Based on results of this study, it is recommended that: (1) An emission inventory be conducted in the Denver Metropolitan Area; (2) A continuing air monitoring program should be established for determination of gaseous and particulate pollution levels; and (3) Enabling legislation should be adopted to provide for an air pollution control district properly empowered to establish and enforce rules and regulations applicable to the entire Denver Metropolitan Area.##

05277

B. J. Steigerwald, L. W. Weinberger, and D. A. Lynn

AIR IONS IN URBAN ATMOSPHERE. A.I.Ch.E. (American Inst. Chemical Engineers.) Preprint. (Presented at the Symposium on Particulates and Air Ions, 55th Annual Meeting, American Inst. of Chemical Engineers, Chicago, Ill., Dec. 2-6, 1962.)

Air ions (charged molecules, molecular aggregates, or small particles in air) are a constituent of all natural atmospheres. Many qualitative observations have been reported of differences in the atmospheric ion content of rural and urban air. The investigation reported in this paper attempted to better define the difference in air ion characteristics between urban and rural locations and to relate ion differences quantitatively to type, degree, and source of air contamination. Results indicate that urban air contains high concentrations of intermediate and large ions and very low concentrations of small ions compared to rural air. The concentration of positive large ions was used to study quantitatively the relationship between air contaminants and atmospheric ions. The data were analyzed statistically by correlation and regression methods. Variations observed in temperature, humidity, and SO2 at ambient concentrations had no effect on large ions. Large-ion concentrations correlated only slightly with particulate concentration as determined by reflectance measurements but correlated very strongly with variations in atmospheric lead concentration, used as an indicator of automobile exhausts. It appears that in complex urban atmospheres air contamination from automobile exhaust is the dominant factor in the alteration of natural atmospheric ion levels.##

05336

C. E. Schumann and C. W. Gruber

AIR QUALITY DATA-1966. Cincinnati Dept. of Safety, Ohio, Div. of Air Pollution Control and Heating Inspection. (May 1967). 3j pp.

The purpose of this report, published for the first time as a separate document by the Cincinnati Division of Air Pollution Control, is to summarize air quality levels of pollutants currently being measured in the City of Cincinnati, including: (1) measurements made wholly by this Division; (2) results of cooperative projects with the U.S. Public Health Service; and (3) summaries of Cincinnati air quality compared to other cities for certain pollutants. Tabular data are given for: dust fall (setteable particulates); soiling index; suspended particulates; wind-blown particulates; gaseous pollutants; and Southwestern Ohio-Northern Kentucky air pollution survey.##

05428

M. Abe

AIR POLLUTION IN SAPPORO AND ITS SOURCES. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo) 4, (2) 1-10, July 1966. Jap.

Primary sources of air pollution in Sapporo are the burning of coal and oil. Pollution is severest in winter since 90.2% more coal and 79.8% more fuel oil is burned during that season. Coal

is used mainly for domestic heating and oil for large industrial plants. The types of coal used and their sulfur contents are tabulated, along with soot-emission concentrations. Hourly, daily, and seasonal changes in SO2 concentration and soot fall-out are tabulated for various areas of the city. Data on air pollution from automotible exhaust is also tabulated. Visibility during the winter between 7 and 10 A.M. and 4 and 8 P.M. is significantly reduced. Economic losses and citizens complaints are categorized.##

05481

AMBIENT AIR: GUILFORD COUNTY, NORTH CAROLINA. Guilford County Health Dept., Greenboro, N.C., Division of Environmental Health. 1966. 52 pp.

The purpose of this report was to provide factual information for the citizens and government of Guilford County for use in the development of a program to control air quality in the area. The County covers an area of 691 sq. miles and has a population of 246,520 (1960 census statistics). Industrial activities include: textile, wood products, machinery and metal products, food products, mineral products, printing and publishing, paint, chemical and fertilizer manufacturing. Pollutants resulting from these activities include: dusts, fines, fumes, smokes, organic vapors, odors, and gases. Sampling data for the year between 1964 and 1966 were obtained by the following methods: high volume samplers for suspended particles, dustfall jar sampling for dusts, AISI tapes for soiling index measurements, and gas samplers for SO2, NO and NO2. The sampling data are tabulated for the various pollutants. Estimated fuel usage in the County for the year of 1965 is tabulated. Estimated sulfur content for coal was 0.9% and 1.0% for commercial and domestic use, and industrial use, respectively. Meteorological aspects here pertaining to air pollution are also reported. Results indicated that an undesirable concentration of air pollution existed, based on levels established in other sections of the nation. More detailed and concentrated efforts are needed on gaseous sampling for achieving meaningful conclusions.##

05499

M. Katz

AIR POLLUTION IN CANADA. Proc. Clean Air Conf., Univ. New South Wales 1, 23-40 (1962).

Air pollution trends in Canada, as in other countries, are influenced by the growth and distribution of population and industry. Increasing efforts have been made by industry and government agencies to control the emissions of sulphur compounds from smelting, oil refining and sour natural gas processing operations through the recovery of useful by-products such as sulphuric acid and fertilizer products or elemental sulphur. A number of elemental sulphur plants have been erected within recent years to utilize the hydrogen sulphide

recovered from the purification of sour natural gas for pipeline distribution systems. These sulphur plants vary in daily capacity from less than 300 to over 1000 long tons. Research at the federal level in Canada on the toxic effects of air contaminants and related problems of sampling, methods of analysis and identification are centralized largely within the Occupational Health Division of the Department of National Health and Welfare. Divisional activities are organized into two main units of environmental assessment and biological studies. An increasing number of industrial companies are becoming aware of the importance of air pollution as a factor in existing and new manufacturing operations. This enlightened attitude on the part of management has resulted in the undertaking of air pollution surveys before and after the construction of their plants, in the assessment of sources of emission to abate or eliminate air pollution problems and in studies to determine the suitability of various sites from an air pollution control standpoint.##

05500

J. L. Sullivan

PARTICULATE AND GASEOUS POLLUTION IN NEW SOUTH WALES CITIES. Proc. Clean Air Conf., Univ. New South Wales, Vol. 1, 16p., 1962, Paper 1.

Measurements of smoke density, sulphur dioxide and oxidant levels have been made in New South Wales on a routine basis since 1958. Smoke densities were found to be high by the standards of American cities but low in comparison to Great Britain. During the months of winter the measured smoke density was above 4 coh units per thousand linear feet for approximately 1/3 to 1/2 of the total time and levels above 10 coh units per thousand linear feet occurred on most winter mornings. Sulphur dioxide varied from approximately 1 to 6 parts per hundred million and extreme levels reached only 10-12 parts per hundred million on the basis of 24 hour samples. The peak hourly concentration measured was 37.0 parts per hundred million, though higher readings were observed in the vicinity of specific sources. In one case a peak of 13.5 parts per million was recorded. Oxidant concentrations, measured by absorption in neutral potassium iodine, varied between the normal background of 0.02 ppm and 19 ppm. Higher concentrations of smoke were observed to occur during anti-cyclonic conditions when a moist maritime flow of air produced stable lapse rates over the coastal area. The extreme smoke density levels were associated with these conditions during the winter months and cold drainage currents from the Dividing Range. The meteorological factors associated with higher oxidant concentrations have not yet been established in Sydney. (Author abstract)##

05551

McMullen, Thomas B., Pensterstock, Jack C., Faoro, Robert B. and Smith, Raymond

AIR QUALITY AND CHARACTERISTIC COMMUNITY PARAMETERS. J. Air Pollution Control Assoc., 18(8):545-549, August 1968. (Presented at the 60th Annual Meeting, Air Pollution Control Association Cleveland, Ohio, June 11-16, 1967, Paper 67-26.)

Statistical correlations between all pairs of 16 selected air quality measurements and 13 selected community parameters for 66 standard metropolitan statistical areas have been calculated, tested for significance, and reviewed for meaningful relationships. Of special interest are the correlations between the sulfate fraction of suspended particulate matter and the use of sulfur-containing fuels (r equal 0.66), between ambient sulfur dioxide and the use of sulfur containing fuels (r equal 0.85), between the lead fraction of suspended particulates and annual purchases of gasoline (r equal 0.71), and between vanadium in suspended particulates and the percent residual fuel oil used in a community (r equal 0.69). Several of these relationships are given more definitive description with mathematical equations that describe how the ambient pollutant concentration varies as a function of a related community parameter. The geographic distribution of high and low pollutant levels is also discussed.

05562

M. Tonomura

COOPERATION ON INSTRUMENTS AND MEASURING. Preprint. 1966.

Since January 1964, measurements have been made on the dust particles, CO, SO2 and nitrogen oxides, with a special emphasis on automobile exhaust gas, at several places of heavy traffic in Tokyo by means of automatic continuous measuring instruments. Measuring instruments for SO2, dust, CO, and nitrogen oxides employed an electro-conductivity system, a scattered light system, an IR adsorption system, and a spectrophotometer, respectively. These instruments were placed in a chamber having a blower alongside the road provided with an inlet of the air at the height of 2.5 meters on the boundary of human and vehicle traffics. Maximum, minimum and average of the concentrations of each substance by hour with traffic density for the years 1964 and 1965 are tabulated as well as the distribution of dust fall and SO2 concentrations for 22 Japanese cities in 1963. Graphic presentation of the Tokyo findings for the year 1965 are also presented. Generally speaking, the amount of traffic and CO showed a fairly good correlation up to 2,000 cars/hour. Nitrogen oxides as well as dust particles showed high concentrations in one area and are believed to be due to exhaust gas of vehicles. The low concentration of SO2 is considered as characteristic of a residential area.##

05573

L. B. Hitchcock, W. L. Faith, M. Neiburger, N. A. Renzetti, and L. H. Rogers

AIR POLLUTION SITUATION IN LOS ANGELES - AN AEROMETRIC SURVEY. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955. pp. 12-23.

This paper summarizes the methods, the results, and some preliminary indications and conclusions employed in the survey. A major purpose of the survey was to monitor presumably important variables so as to provide a more adequate basis for diagnosis of the general problem. Pinto beans were used to measure the plant damaging effects of smog. Also measured were oxidants, nitrogen dioxide, hydrocarbons, carbon monoxide, aldehydes, sulfur dioxide, particulates, and meteorological factors. Some of the recommendations derived from the survey are that more complete meteorological measurements be obtained, that plant damage as a measure of smog be given more extensive study, and that a minimum of 14 monitoring stations be established in the Los Angeles Basin.##

05627

W. E. Scott, E. R. Stephens, P. L. Hanst, and R. C. Doerr

FURTHER DEVELOPMENTS IN THE CHEMISTRY OF THE ATMOSPHERE. Preprint. (Presented at the Session on Air Pollution, 22nd Midyear Meeting, American Petroleum Inst., Division of Refining, Philadelphia, Pa., Mat 14, 1957.)

The technique of long-path IR spectroscopy is currently being used at the Franklin Institute both for direct studies of atmospheric pollution and for laboratory experiments. With the field instrument, concentrations of most of the important pollutants in the Los Angeles atmosphere were measured as a function of time and meteorological conditions. These studies supported the general picture of atmospheric pollutants and their reactions which was developed from laboratory studies both at The Franklin Institute and in other laboratories. Laboratory studies indicated the concentrations of NO and NO2 would be quite low in smog. The organic nitrogen compound, identified as perozyacyl nitrite, was a prominent product in the laboratory studies, and it was predicted that this compound would be found in the smog. Both of these conclusions were confirmed by atmospheric analysis. The presence of ozone, long used as the primary smog indicator, was also confirmed. Air analyses for several major pollutants, made after sundown, showed a close similarity to an analysis of diluted automobile exhaust and to an analysis of air taken near a heavy traffic center. Several compounds whose presence in polluted air has been suspected were found to be below the limit of detectability. Among these were H2Co, HNO3 and CH3OH. Reaction products of O3 with olefins at low concentration (30 ppm to 60 ppm) were identified as aldehydes, CO, CO2, water, and, from propylene and 2-pentene, ketene. Other products of the reaction between O3 and the higher olefins were indicated. Yield of CO and CO2 indicated a definite connection between chain length and the decomposition of products. Several pure ozonides were prepared at low temperature, and their infrared spectra recorded. In some cases the decomposition products were determined.##

05652

Anderson, D. O., Williams, I. H., and Ferris, B. G., Jr.

THE CHILLIWACK RESPIRATORY SURVEY, 1963: PART II. AEROMETRIC STUDY. Can. Med. Assoc. J. 92, 954-61, May 1, 1965.

A study of the quality of the ambient air at Chilliwack, British Columbia, was conducted from May 1963 to April 1964. Measurements of dustfall, sulfation, hydrogen sulfide, oxidants and total hydrocarbons were made by a network of five sampling stations. The results of this survey indicated that Chilliwack was relatively free from any air pollution and would therefore be a suitable control for a study of the relationship between community air pollution and respiratory disease.

06141

THE PRESENT STATUS OF AIR POLLUTION IN OSAKA CITY. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo)

Data on air pollution for the city of Osake from 1960 to 1966 are given in tables and graphs as follows: 1.) Meteorological data on temperature, humidity wind velocity, and wind direction gathered from the Osaka Meteorological Observatory, Itami Airport, and Yao airport. 2.) Quantities of heavy oil, coal, coke, and gas used in Sakai and Osake in February, 1964. 3.) Yearly variations of dust fall in eight places for five years (1960 through 1964) are tabulated for example, an over-all decrease from 24.5 tons/sq. km./month in 1960 to 18.9 tons/sq. km./month in 1964). The concentration of floating dust in 1965 was from 0.8 to 1.8 mg/cu.m./day with peaks around 8 A.M. and 8 P.M. 4.) Yearly and hourly variations of SO2 and SO3 concentration in 26 places in the city indicating that the amount is increasing (0.95 mg/100 sq. cm./day in 1960 to 1.35 mg/100 sq.cm./day in 1964. 5.) Pollution by automobile exhaust at two heavy traffic circles (11,000 cars/hr) indicated maximum instantaneous values of CO2 emission were 4.6 ppm and CO emission 85 ppm. Averages for SO2, NO2, NO, HCHO, and ozone were also tabulated. 6.) Yearly, monthly, and hourly concentrations of smog are tabulated indicating peaks are highest around 9 A.M. and when the wind is no more than 1.3 m/sec. 8.) Visibility data is illustrated on a map of the city.##

06150

H. Sakabe, R. Soda, Y. Matsumura, K. Honma, and K. Nozaki

AIR POLLUTION STUDY AT HEAVY TRAFFIC ROAD. (Bull. Natl. Inst. Indust. Health, (Kawaskai, Japan)) (4) 72-6, 1960. Jap.

A report is given of the hourly measurements of air pollutants between 8 A.M. and 7 P.M. on March 3 and 4, 1960 at a heavy traffic circle in Tokyo. The meteorological conditions were: temperature 5 to 15 deg. C, humidity 38 to 78%, and wind

velocity 1 to 4 m/sec. The pollutants measured and methods of measurement are as follows: CO (Kitagawa-type tester), SO2 (Thomas' Method), HCHO (Sodium Hydrogen Sulfite and Chromatropic Acid Sodium Salt Method), and NO and NO2 (Okasa-Toda Method). The results are tabulated and graphs of the hourly variation are given. The average findings were CO, 2.5 to 20.0 ppm; SO2, 0.02 to 0.097 ppm; HCHO, 0.035 to 0.2 ppm; and NO plus NO2, 0.008 to 0.032 ppm. The highest concentrations were found between 8 and 10 A.M. and between 6 and 7 P.M.##

06169

R. I. Brabets, C. K. Hersh, and M. J. Klein

OZONE MEASUREMENT SURVEY IN COMMERCIAL JET AIRCRAFT. J. Aircraft 4 (1), 59-64 (Feb. 1967). (Also published as report AD 600360 by IIT Research Inst., Chicago, Ill., Contract ARDS-608, TR-ADS-5, 54 p., Nov. 1963.)

The purpose of this survey was 1) to measure accurately ozone concentration in commercial jet aircraft cabins and/or flight crew compartments on flights above 25,000 ft in order to obtain a 12-month statistical evaluation with emphasis on seasonal and meteorological correlations, and 2) to locate and chart the ozone-enriched air masses in order to obtain further meteorological correlations and to establish any abnormal conditions that result in exposure to large ozone concentrations. The ozone concentration in aircraft was measured during 285 commercial jet flights between September 1, 1962 and August 31, 1963. These flights ranged over all segments of the United States and included sections of Canada and the North Atlantic. All types of commercial jet aircraft currently employed by air carriers were monitored. The ozone measurements recorded on each flight were evaluated, and the data were correlated graphically to show seasonal variations. The maximum continuous ozone exposure encountered on a domestic flight was 20 or more parts per hundred million (pphm) by volume for 140 min; the maximum on a northern flight was between 20 and 30 pphm for 4 hr; the highest concentration encountered was 35 to 40 pphm for 20 min. The most significant finding was that little or no ozone was detected on flights below the tropopause. At or above the tropopause, the internal concentration was usually above 5 pphm; in most cases it was above 10 pphm.##

06192

Miura, T. K. Kimura, K. Kimotsuki, H. Okusa, o. Tada, and T. Sawano

COMPARISON OF THE CONCENTRATION OF SUSPENDED PARTICULATE MATTER AND GASEOUS POLLUTANTS BETWEEN INDOOR AIR AND OUTDOOR AIR IN URBAN AREA. Rodo Kogaku (J. Sci. Labour Tokyo), 41 (10), 493-500 (1965). Jap. (Tr.)

The concentration of suspended particulate matter and gaseous pollutants of indoor and outdoor air in Tokyo was determined at several locations including factories, business machine rooms and

offices. The concentration of suspended particulate matters was determined by Roken Type long term recording impactor and gas analysisfor SO2, NO2, and HCHO of indoor and outdoor air was carried out at the same time. The electromicrographs revealed that most of the particulate matter in the urban area was microfine, seeming to be carbon particles and some mist particles. The concentration of suspended particulate matter of the outdoor air in the urban area ranged from 0.05 to 0.5 mg/cu m and that of the indoor air in air conditioned rooms ranged from 0.01 to 0.3 mg/cu. m. The attenuation efficiency of an air filter with electrostatic precipitator for suspended particulate matter was high. The concentration of SO2 of the indoor air was lower than that of outdoor air, but the differences were not marked in cases of NO2 and HCHO. (Authors' abstract, modified)

06290

Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control

WASHINGTON, D. C., METROPOLITAN AREA AIR POLLUTION ABATEMENT ACTIVITY. ((212))p., Nov. 1967. 18 refs.

From February 1967 to August 1967 the Public Health Service conducted a technical investigation in the Washington, D.C., metropolitan area to provide information that could form a basis for recommendations for abatement in accordance with the tenets of the Clean Air Act. The results are presented of the 1967 investigation and the methods, techniques, and procedures are described. In concert with cooperative regional and local agencies, an air quality network was established, an emissions inventory was conducted, extensive meteorological data were acquired, air pollution effects on vegetation and various materials were investigated, and special data processing and summarization techniques were developed. The boundaries for the activity conformed to the Metropolitan Washington Council of Governments' area which includes the District of Columbia; the Maryland counties of Montgomery and Prince Georges; the Virginia counties of Arlington, Fairfax, Loudoun, and Prince William; and the independent cities of Alexandria, Falls Church, and Fairfax.##

06551

A. Goetz

VISIBILITY RESTRICTION BY PHOTOCHEMICAL AEROSOL FORMATION. Preprint. (Presented at the Air Pollution Research Conference, Los Angeles, Calif., Dec. 6, 1961.)

Photochemical aerosol formation is caused by the temporary accumulation of reaction products from certain atmospheric trace components upon nucleating particulates and results in their substantial size increase. These reactions require the coexistence of certain unsaturated hydrocarbon types (e.g.

olefins), oxidizing gas traces, such as NO, NO2, O3), and irradiation in the 320 - 400 millimicron range of the sun spectrum. The presence of additional SO2 traces can enhance significantly the aerosol formation. The final size of these aerosol particles depends on that of the nucleating particles present prior to photo-activation, on their concentration, and that of the reaction products. Such smog aerosols are predominantly in the diameter range between 0.3 micron - 1.0 micron with a frequency about inversely proportional to the particle volume and of a concentration of 10 to the 9th power to 10 to the 10th power per cu m. As this size range is practically not subject to fallout by gravity and also coincides with the optically visible wave-lengths, such aerosols are most effective (Mie-type) light scatterers and cause lasting, strong visibility restriction. The relation of the latter to the particle growth is discussed in some detail. (Author's abstract)##

06559

NATIONAL AIR SURVEILLANCE NETWORKS ANNUAL TABULATIONS - 1966. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control (June 1, 1967). 207 pp.

A complete tabulation is provided of 1966 NASN's data. The tabulations are arranged in alphabetical order by states and include: Suspended Particulates, (141 Stations); Gas Network, (52 Stations); and Lead Candle Network (Sulfation Rate), (24 Stations). No analysis of the data is presented. Analyses will be included in the Annual Report.##

06700

NATIONAL AIR SURVEILLANCE NETWORKS - FIRST QUARTER TABULATION 1967. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (1967). 217 pp.

The data obtained by the National Air Sampling Network (NASN) during the first quarter of 1967 are presented. The tabulations are arranged in alphabetical order by state and include data on suspended particulate, SO2 and NO2.##

06701

NATIONAL AIR SURVEILLANCE NETWORKS CONTINUOUS AIR MONITORING PROGRAM (1966 DATA TABULATIONS AND SUMMARIES FOR CHICAGO, CINCINNATI, DENVER, PHILADELPHIA, ST. LOUIS, AND WASHINGTON, D.C.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (1966). 551 pp.

The Continuous Air Monitoring Program is the National Air Surveillance Network which operates six continuous monitoring stations in major cities throughout the country. The data tabulations in this booklet are summaries of hourly concentrations of gaseous pollutants and 2-hourly summaries of soiling index levels during 1966. Also enclosed is a brief summary of monthly means and maxima, and annual frequency distributions of data from all stations.##

06707

SUMMARY OF 1964-1965 AIR QUALITY MEASUREMENTS. 90th Congress ("Air Pollution--1967, Part 3 (Air Quality Act") Senate Committee on Public Works, Washington, D.C., Subcommittee on Air and Water Pollution, April 19, May 2-4, 8-10, 1967.) p. 129801306.

Air pollution surveillance activities conducted by the National Center for Air Pollution Control include a nationwide network of stations equipped for periodic measurement of suspended particulate matter and, in some instances, such gaseous pollutants as sulfur dioxide and nitrogen dioxide; a six-city network of stations equipped for continuous measurement of several gaseous pollutants; and a relatively new network of stations designed to provide a general indication of effects of air pollution on various types of materials in interstate regions. Data from both the periodic and continuous air sampling stations are discussed.##

06723

J. S. Nader

DATA ACQUISITION SYSTEMS IN AIR QUALITY. Symp. Environ. Measurements, Cincinnati, Ohio, 1963, (PHS Publ. No. 999-AP-15.) (July 1964). pp. 107-23.

Two major automated data acquisition systems are now being used in the United States for air quality measurements. These systems, operated by the Los Angeles County Air Pollution Control District and by the U.S. Public Health Service (Continuous Air Monitoring Program), are reviewed in detail; plans for automated data handling by the California State Health Department are discussed briefly. Design and operation of these systems are reviewed in terms of sampling, detection, recording, data validation, and data display. (Author's summary)##

06749

I. Kodama

AIR POLLUTION IN KANAGAWA PREFECTURE. Kuki Seijo (Clean Air - J. Japan. Air Cleaning Assoc., Tokyo) 4, (2) 23-9, July 1966. Jap.

The Kanagawa prefecture with an area of 2361 sq. km and a population of 4,430,000 has 60% of its population and 66.5% of its factories concentrated in the cities of Yokohama and Kawasaki. There are 1270 factories and facilities generating dust and soot in these cities. The meteorological conditions in the cities are described. The yearly variation of dust fall in industrial, semi-industrial, business, and residential areas for 1957 to 1965 is graphed showing an average of 26.5 tons/sq. km month in the industrial area of Kawasaki, 17.3 in the semi-industrial area, 12.5 in the business section, and 9.2 in the residential area.

The dust fall consisted mainly of Fe203, CaO, and SO4. The hourly variation of floating dust indicated a peak in the afternoon. The greatest concentration was found in December. Maps of the two cities are included showing the concentration of sulfur oxide in summer and winter. Graphs showing the amount of smog, which has been increasing remarkably in summer, show the variation between the smog and the concentration of air pollutants.. As for automobile exhaust, the hourly variation of CO concentration is given along with the number of cars at that time. The effect of pollution on visibility is discussed. The number of days in which the restriction of visibility is severe is three times as many as 20 years ago.##

06760

N. Saruta

AIR POLLUTION IN NORTHERN KYUSHU. Kuki Seijo (Clean Air - J.. Japan Air Cleaning Assoc., Tokyo) 4, (2) 35-45, July8 1966.. Jap..

A preliminary investigation of air pollution in northern Kyushu was started in 1952 and studies on existing conditions have been carried out since 1959. The yearly and monthly amounts of dust fall and SO2 in the five wards of northern Kyushu are tabulated for 1959 through 1965. The results show decrease in dust fall (from 26.49 to 20.73 tons/sq. cm./month) and in increase in SO2 (from 0.25 to 0.64 mg/100 cc/day). Tabulations of dust fall and SO2 are given for the industrial, business, and residential sections.. The Fe203 present in red smoke has also been measured and averages between 2.0 and 2.8g/sq. m/month. Measurements of 3,4-benzopyrene and components of automobile exhaust such as CO, SO2, Pb, NO, and NO2 are also tabulated for the five wards.##

06788

(STUDIES OF AIR POLLUTION IN THE DEPARTMENT OF THE SEINE IN 1965. PART 3. CONDITIONS AT ORLY AIRPORT.) Etudes de Pollution Atmospherique dans le Departement de la Seine en 1965. Troisieme Partie. Operation "Aerodrome d'Orly." Laboratoire Municipal de la Prefecture de Police, Paris, France. (Apr.. 1966.) pp. 1-2, 9, 11, 13-7. Fr.

The results of an air pollution study made at Orly Airport at the request of the medical services at the airport are given. The survey covered the exposure to ground personnel and an investigation of the components of the fuel and emissions from jets. The investigation was conducted by a mobile air pollution laboratory located at the field during the study.. In general, the pollution was neglible, the emissions from the jets were not a matter of concern, but there was a nuisance hazard to workers on piston planes. The carbon monoxide was determined by infra-red absorption with an average reading recorded every 15 min. The averages ranged from 0.5 to 18 ppm. The other contaminants that were determined included carbon dioxide, nitric oxide, nitrogen dioxide, sulfur dioxide, aldehydes, lead, 3,4-

benzopyrene, toluene, xylene, and benzene, and in all cases the results were much lower than those obtained in various stations in Paris. Both on the basis of analyses made on ambient air and on emissions from jets there is little evidence of air pollution at Orly Airport in Paris.##

06872

K. L. Shesterikova P. N. Strogal'shchikova

ATMOSPHERIC POLLUTION BY NITROGEN OXIDES. (Zagryaznenie atmosfernogo vozdukha okislami azota.) Hyg. Sanit. (Gigiena i Sanit.) 30 (5), 232-3 (May 1965). Russ. (Tr.)

Determinations of nitrogen oxides concentration over the streets in Chelyabinsk, Russia, during peak traffic hours were compiled. In 51% of the samples, nitrogen oxides exceed the maximum permissible concentration (0.3 mg/cu m). The lowest concentrations of nitrogen oxides are found at two points, where the traffic density is lower and the broad streets are situated on an elevation, therefore in a well ventilated position.##

06948

CRITERIA FOR AIR QUALITY AND METHODS OF MEASUREMENT. World Health Organization, Geneva, Switzerland. (Rept. No. WHO/AP/23.) (Presented at the Inter-Regional Symposium, Geneva, Switzerland, Aug. 1963.) (Sept. 10, 1963). 20 pp.

An Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement was convened in Geneva from 6-12 August 1963. Twenty experts in the field of air pollution from 15 countries in the American and European Regions of WHO presented technical papers and participated in the discussions. The Symposium discussed the rationale for selecting air quality criteria in Member countries, the role of epidemiological surveys in establishing guides to air quality, and studies on effects indirectly related to human well-being, such as damage to vegetation, soiling of surfaces, and reduction in visibility. The Symposium also defined the areas in which further research is needed to produce data that will serve as a sound basis for establishing guides to air quality; the participants emphasized the need for agreement on methods of measurement that, even if not identical, yield comparable data. Topics discussed (1) General considerations; (2) Rationale for selecting air quality criteria; (3) Role of epidemiological and aerometric surveys; (4) Damage to vegetation, soiling of surfaces and visibility reduction; (5) medical studies needed for the improvement of data relating to guides to air quality; (6) needs for the standardization of methods of sampling and analysis of ambient air pollutants; (7) need for international collaboration and agreement on air quality criteria and methods of measurement.##

06960

E. W. Dahle, Jr.

ANNUAL REPORT OF THE BUREAU OF INDUSTRIAL HYGIENE, 1966. Baltimore City Health Dept., Md., Bureau of Industrial Hygiene. (1966). 15 pp.

Some results of industrial hygiene investigations are cited. The atmospheric monitoring program is discussed and the results of sampling for oxidants, aldehydes, nitrogen dioxide, and dust fall are graphed. Complaints involving air pollution are tabulated.##

06977

AIR RESOURCES IN THE MID-WILLAMETTE VALLEY. Mid-Willamette Valley Air Pollution Authority, Salem, Oreg. (Dec. 1966). 80 pp.

In October of 1965, a survey and sampling program was initiated to determine the quality of air within the five counties of Benton, Linn, Marion, Polk and Yamhill. Phase I of this survey was accomplished by location of major sources of air pollution, identification of amounts and kinds of pollutants and, with meteorological data, establishment of dispersal and disposition patterns of pollution. Sources of pollution in the Mid-Willamette Valley consist mainly of combustion of fuels for heat and power, process emissions, and industrial and community solid waste disposal practive. Other sources of lesser significance at this time include auto exhaust emissions and agriculture and forest management practices. Intermittent build up of suspended particulates occurs during inversion periods throughout the year. Any month of the year in Salem will see inversions two of every three mornings. In conclusion, the early findings in the study do not indicate the need for a crash program of air pollution control. There is a strong indication that unless a preventive program is initiated to cope with the expansion and growth of communities and industries, the quality of the air supply will rapidly deteriorate.##

07083

Jaffe, L. S. and H. D. Estes

OZONE IN HIGH-ALTITUDE AIRCRAFT CABINS. Arch. Environ. Health, 9:61-71, July 1964

An analysis of ozone at high altitudes was undertaken to assess the nature of the ozone problem in relation to current jet aircraft and particularly the planned supersonic air transport (SST). Ozone is present in significant quantities in the atmosphere starting above the tropopause and in toxic concentrations in the stratosphere reaching a peak at about 70,000-90,000 ft. The ambient ozone concentration varies with geographic latitude, season

of the year, and meterological factors. The exact cabin concentrations of ozone in various types of current jet aircraft at different altitudes are being studied in relation to these factors to determine whether or not an environmental health problem actually exists, particularly for aircrews. High ambient ozone concentrations of 5 - 10 ppm are found at altitudes of 65,000 - 80,000 ft. through which the SST will cruise. The air used for cabin pressurization passes through the compressors too quickly to destroy all the ozone present by adiabatic heating. Unacceptable concentrations of ozone will be present in the cabin environment of the SST unless devices are employed, such as catalytic filters or engineering techniques for delaying or increasing the dwell time of the ambient air intake through the compressors long enough for adiabatic heating to destroy or reduce the ozone content below 0.2-0.3 ppm.##

07103

J. P. Lodge, Jr., A. J. MacDonald, Jr., and E. Vihman

A STUDY OF THE COMPOSITION OF MARINE ATMOSPHERES. ((Tellus (Uppsala))) 12 (2), 184-7 (1960).

Data on trace substances in air, obtained in mid-Pacific during two summers, are summarized. Particulate matter was analyzed for chloride, sulfate and nitrate; tests were performed for ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. The results give information concerning the composition of marine air which can assist in evaluating possible natural contributions to urban pollution on the West Coast of the United States during the summer months, in addition to the geochemical value of the work. (Authors' abstract)##

07118

R. L. Stockman and P. W. Hildebrandt

EVALUATION OF AIR POLLUTION IN THE GREATER SPOKANE AREA (SPOKANE, WASHINGTON). ((Washington State Dept. of Health, Olympia, Division of Engineering and Sanitation.)) (1961). 94 pp.

An area survey of Spokane, Washington was conducted to develop sufficient basic information by which an estimate of current and potential air pollution problems and their significance could be made, and to provide a basis for local government to determine what appropriate action should be taken. The survey included the development and evaluation of data on population factors, topography and meteorology, existing and potential sources of pollution, data from past air sampling studies and from concentrated sampling during this survey.##

07120

Louw, C. W. and E. C. Halliday

FIRST REPORT ON ATMOSPHERIC OXIDANT MEASUREMENTS IN THE TOWNS OF PRETORIA, DURBAN AND JOHANNESBURG. S. African Ind. Chem., 18(11):218-221, Nov. 1963. 19 refs.

A short survey was made of the oxidant level in the atmospheres of Pretoria, Durban and Johannesburg, South Africa. It was necessary to make control measurements in the country, away from town pollution influences. These measurements were made at Hammanskraal. Assessment of oxidant (including ozone, peroxides and nitrogen oxides) in the air was done by a slightly modified version of the standard phenolphthalin method as applied by the U.S. Public Health Service for Air Pollution work.
Averages of oxidant concentration for Pretoria, Durban and Johannesburg are of the same order of magnitude. Average oxidant concentration for the country atmosphere is slightly higher than that of any of the three towns. The average atmospheric oxidant concentrations obtained for Pretoria, Durban and Johannesburg compare favourably with other large towns in America and Europe and are at present substantially below the pollution level at which unfortunate biological effects can be experienced.##

07166

K. Horiuchi

A STUDY ON THE STATUS QUO OF AIR POLLUTION IN JAPAN. Osaka City Med. J. (Japan) 10(1):181-200 (1964). (Presented at the Expert Committee on Air Pollution, World Health Organization, Geneva, Switzerland, Oct. 15-21, 1963.)

The major sources of air pollution in Japan and the important pollutants, are discussed and tabulated. Results of epidemiological surveys are described including morbidity and mortality data. Regulations of the Japan Public Health Association are listed and items covered are: maximum allowable concentrations; emission standards; and analytical, sampling, and measurement methods.##

07198

Y. Kawanami

AIR POLLUTION IN TOKYO. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 4(2):11-22 (July 1966). Jap.

A definition of smog is given as the restriction of visibility to less than 2 km in the city and vicinity, excluding the restriction by rain. Out of 154 days when smog occurred in Tokyo in 1965, 64 were caused by heavy fumes and 90 by mist or haze. The differences in times of occurrence of heavy fume-type smog and mist

or haze-type smog is discussed. The yearly variation of the number of "smog days" is graphed indicating seasonal influences. Smog decreases in winter but increases in summer and fall. The current status of air pollution in Tokyo is also covered with respect to dust and soot fall, floating dust, sulfuric acid, nitrogen oxides, hydrocarbons, and lead compounds. Measurement of dust and soot fall in Tokyo began in 1955 and yearly variations are graphed through 1965. Dust fall reaches a peak between February and May and then again in August and September. These peaks are related to the meteorological influence of strong winds in spring and large amounts of rain in spring and late summer. Therefore, July and December are considered the best times to investigate air pollution without meteorological influence. Lengthy discussion is given to daily and hourly variations of pollution peaks in urban, industrial, and suburban areas.##

07239

Minowa, T.

PRESENT CONDITION OF AIR POLLUTION IN YOKOHAMA AREA. Kuki Seijo (Clean Air, J. Japan. Air Cleaning Assoc.) (Tokyo) 3(4):5-10, 1965. Text in Japanese

A systematic investigation of air pollution in Yokohama was started in 1957. The hourly, daily, and monthly variations in concentration of pollutants are tabulated. The number of "smog days" is graphed from 1946 to 1964 showing an increase beginning in 1955 with the present total being twice as great as before 1954. Studies of SO2 concentration indicate that it was twice as great in 1964 as in 1957. The amount of dust fall appears to be decreasing, especially in the industrial area; it dropped from 70 tons/sq. km. month in 1956 to 18 tons/sq. km./month in 1964. There has been little change, however, in commercial and residential areas. Monthly variations of smog indicate that the condition occurs more readily in winter than in summer; the largest dust fall level occurs at the end of spring and the beginning of summer and is smallest at the end of fall and the beginning of winter. Floating dust and SO2 concentrations are greatest from December to February. Smog in winter has two peaks: the higher one between 8 and 9 A.M. and the other between 8 and 9 P.M.; in summer there is usually one peak between 5 and 9 A.M. Sulfur oxides and floating dusts show two peaks, depending on meteorological conditions. Sulfur dioxide concentration depends more on wind velocity than do floating dust and soot. Usually SO2 concentration is not high when wind velocity is greater than 5 m/sec. The effects of sunlight on air pollution are also discussed. According to measurement, the absorbed ultraviolet radiation was about 50% for an SO2 concentration of 0.85.##

07245

T. Sekigawa

IONS IN AIR. II. Kuki Seijo (Clean Air, J. Japan. Air Cleaning Assoc.) (Tokyo) 3 (3), 46-50 (1965). Jap.

A study was made on the physical aspects of air pollution in realtion to the present situation in cities and according to methods of measurement of very small particles. In the center of Tokyo, the ratio of dusts present according to particle sizes of 19 plus or minus 2 microns, 7.5 plus or minus 0.3 microns, and 0.9 plus or minus 0.1 microns is 1:1.3:15.2:103. The distribution of particles 0.9 plus or minus 0.1 microns in size is given. The study of extremely small particles (less than 0.1 micron) has not been extensive. Methods of measurement generally used are the coagulation method (density of fog generated by the particle is measured), the diffusion coefficient method (Strokes-Cunningham equation used to calculate the particle size from the diffusion coefficient), and the charge separation method (particle size obtained from mobility of the charged particle). An illustration given of floating dust and polluted air measured indoors by the mobility spectrum. For measuring the weight of floating dusts, an automatic recording-type impactor was used and for measuring ion concentration, the H H-type large size ion meter was used. Hourly variations of floating dust concentration indoors and out are graphed as well as variations of small ions based on temperature, humidity, and wind direction. In connection with the ion spectrum, small and medium ions can be separated clearly in clean air, but the spectrum becomes continuous as pollution increases. Roughly speaking, the quantity of small ions present is inversely proportional to the amount of dust in the air. Medium size ions increase as humidity increases.##

07371

Hayashi, S.

THE PRESENT SITUATION OF COUNTER MEASURES FOR PUBLIC NUISANCE IN JAPAN. Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc.,) (Tokyo), 1(1):8-12, 1964.

General information on public nuisance in connection with the rapid development of industry in Japan is given. As for the present status of air pollution, the amount of dust fall, SO2, and automobile exhaust are investigated. Dust fall and SO3 measured at 296 places is tabulated where the maximum dust fall is 137 tons/sq. km. per month (in northern Kyushu) and the minimum is 2 tons/sq. km. per month, and for SO3 the maximum is 2.7 mg/100 sq. cm. per day. In 1962, the maximum SO2 value of 0.23 ppm/hr was recorded and a concentration of 0.1 ppm/hr lasted for 19 hours in Tokyo. As for automobile exhaust, an instant CO value of 10 to 20 ppm has been recorded very often and a maximum of NO2 was found between 0.02 to 0.05 ppm. A "public nuisance prevention" law has been established mainly for the three largest industrial areas, but some prefectures will not enforce it.##

07390

A. J. Lynch, E. J. Bowmer, A. Sykanda, J. H. Smith, J. H. Emslie

COMPARISON OF METEOROLOGY AND AIR QUALITY BETWEEN TWO COMMUNITIES IN BRITISH COLUMBIA--A PRELIMINARY REPORT. Can. J. Public

Health (Toronto), 58(6):241-248, June 1967. 16 refs.
(Presented at the Annu. Meeting, Air Pollut. Contr. Ass., Pacific Northwest Int. Sect., Seattle, Wash., Nov. 3-4, 1966.)

Two series of sampling stations have been established to develop methods for the comparison of meteorological and air quality findings in an area exposed to the contaminants from kraft pulp and paper mills with an unpolluted control area. The climate was maritime in both towns and there were inversions in both valleys in both winter and summer. The preliminary report covers the methods used in establishing the sampling stations and the meteorological observations and analyses made between Oct. 1965 and June 1966. Six stations were established in the polluted town and three in the control town in industrial, commercial, and residential locations. The study will continue until March, 1968 with additional meteorological and air quality measurements. Preliminary values show the dust fall in the polluted town varying from 20 to 50 tons per sq mile and from 4 to 10 tons per sq mile in the control town. A secondary object of this study was to relate the concentration of air contaminants to the incidence of respiratory disease and to assess the long-term effects on health of low concentratjons of contaminants.##

07448

C. B. Robison, J. C. Chambers, J. W. Bates

DEFINING THE PROBLEM OF AIR POLLUTION IN METROPOLITAN BIRMINGHAM, ALABAMA. Preprint, Jefferson County Dept. of Health, Ala., ((32)) p., June 1967. 15 refs.

The air pollution problem in Metropolitan Birmingham, Alabama is presented. The results and recommendations of previous and current studies of air pollution in Jefferson County are compiled. Possible methods of air pollution control are also discussed. The topography of the Birmingham area is irregular, consisting of ridges with intervening valleys. The city proper is in a valley. The main climatic effect of the topography is that during winter months it produces extreme temperature inversions and rather low minimum temperatures. The range of annual averages of suspended particulate matter in the 10 station sampling network varied from 72 to 281 microgram/cu. m. Results show that 20% of the time suspended particulate matter in Jefferson County exceeds 265 microgram/cu. m. The annual averages for dustfall range from 9.5 tons/sq. mi./mo to 87.8 tons/sq mi./mo. Sulfation levels are generally rather low in Jefferson County. Sulfur dioxide levels are generally low year round with the winter season having the highest concentrations. Nitrogen dioxide was the only gaseous pollutant found in any significant quantities with the range of daily levels being 0.7 to 62.7 parts per hundred million. Daily aldehyde lebels ranged from 0 to 4.0 parts per hundred million. Air pollution comes from four main sources: (1) Domestic, (2) Transportation, (3) Commercial and (4) Industrial. Stationary sources include the domestic,

commercial and industrial. Industrial sources account for approximately 98% of the particulate emissions, 88% of the gaseous emissions and 53% of the hydrocarbon emissions from stationary sources. In comparison with stationary sources transportation contributes only slightly to the particulate matter. The results of the public opinion survey showed that 54% of the people within the City of Birmingham and an average of 42% of the people outside the city limits were annoyed or affected adversely in some way by air pollution.##

07478

Dmitriev, M. T. and O. I. Yurasova

CONTENT OF THE PRODUCTS OF THE RADIOLYSIS OF AIR IN THE WORKING CHAMBERS OF A POWERFUL GAMMA UNIT. ((K voprosu o soderzhanii produktov radioliza vozdukha v rabochikh kamerakh moshchnykh gamma-ustanovok.)) Hyg. Sanit. (English Translation of: Gigiena i Sanit.), 32(3):442-447, March 1967. 10 refs.
CFSTI: TT 67-51409/1

The degree of formation of ozone and nitrogen oxides in the air of the working chamber of a powerful gamma-unit was investigated. The ozone was determined from the decomposition of potassium iodide, while the nitrogen oxides were determined by Griess's reaction as modified by Gorodetskii (1960). The nitrogen oxides were determined at the worksite in the respiratory zone of the operator at a distance of 1.5 - 3m from the irradiator, 1 min after its immersion in water and the entry of people into the working chamber. With an air change factor of 10 vol/min, the plenum-exhaust ventilation of the working chamber of the gamma-unit reduces the concentration of nitrogen oxide at the worksites to 0.04 - 0.9 mg/cu. m., which is 1/5 - 1/100 of the maximum permissible concentration. Considerable concentrations of ozone were found in the space between the irradiator planes at the moment of irradiation. With an irradiation time of 20 min and dose rates of 300 to 600 rad/sec, the concentrations were 0.21 to 1.92 mg/cu. m., when the plenum-exhaust ventilation was turned off. When it was working, the concentration of ozone decreased to 0.34 - 0.84 mg/cu. m., which is still above the maximum permissible concentration for industrial premises. In cases where it is necessary to exclude the harmful effects of ozone on the irradiated material, the ventilation calculations should take into account the high concentration of ozone near the irradiator.##

07529

S. Hayashi

PUBLIC NUISANCE PROBLEM AND ITS COUNTERMEASURE IN YOKKAICHI CITY. Text in Japanese. Kuki Seijo (Clean Air, J. Japan. Air Cleaning Assoc., Tokyo) Japan Air Cleaning Assoc. (Tokyo), 2(3):1-18, 1965.

In a study of the environmental conditions of Yokkaichi City, it was found that the amount of soot and dust fall has been

decreasing, but SO2 and SO3 concentration are increasing. The main section of the Yokkaichi industrial area is made up of two large industries containing a power station using only heavy oil. One of the problems to be considered is the poor city planning which does not take into account existing meteorological conditions. Investigations were made on soot and dust fall, sulfur oxides, H2S, NO2, NO3, and Cl. Methods of sampling, places sampled, and duration of tests are tabulated. The British standard deposit gage was used for dust fall, the high-volume air sampler for floating dusts, and the PbO2 method for SO2 measurement. The maximum quantity of dust fall measured between December 1962 and October 1963 was 40.99 tons/sq. km month. The yearly variation is graphed showing the inclination toward decrease. The highest average value of SO2 determined was 2 mg/day. The range of value is wide in Yokkaichi city. The ratio of SO2 : SO3 was shown to be more than 1:1. Medical investigations were also performed on 30,000 people. The quantity of dust and soot fall and SO2 is tabulated for 20 places with the corresponding occurrences of colds, bronchitis, emphysema, heart disease, eye disease, and allergic dermatitis. The relation between SO2 concentration and the occurrence of throat disease, colds, emphysema, and bronchitis for children up to 4 years of age and for people over 50 is graphed indicating a notable relation.##

07712

Braverman, M. M.

TRENDS AND LEVELS OF AIR POLLUTION IN NEW YORK CITY. Am. Ind. Hyg. Ass/c. J. 28 (3):291-293, May-June 1967. 6 refs.

The Bureau of Laboratories of the Department of Air Pollution Control of New York City has maintained a comprehensive monitoring program of significant parameters of air pollution for over ten years. Trends and levels of concentrations of gases and particulates over this period are presented. Comparisons of the concentrations of gaseous pollutants with their threshold limit values (TLV) present a novel perspective of their significance. Gaseous pollutants that emanate chiefly from motor vehicles for which adequate control devices were not in use, continued to show a slight upward trend. Particulates continue to show a slight downward trend. Evidence is presented which demonstrates that more significant values may be achieved when absolute concentrations of gaseous pollutants are compared with their respective threshold level values.##

08067

Alkire, [illegible] J. and C. R. Wyss

AIR QUALITY SURVEY AT SELECTED SITES ON THE HANFORD PROJECT. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., Contract AT(45-1)-1830, 16p., Nov. 1967. 9 refs.
CFSTI: BNWL-564

The concentration of five potentially significant air pollutants (SO2, NO, NO2, HCHO, and H2S) was measured at selected sites on the Hanford Project during the period May 17, 1967, through July 14, 1967. The observed concentration of these gases was below the detection limit most of the time, but significant levels of nitrogen oxides and sulfur dioxide were observed at some sites part of the time. Downwind of a chemical separations plant, nitrogen oxides (NO + NO2) were above detection limits (0.01 ppm) about 30% of the time. Peak NO + NO+2 CONCENTRATIONS ranged to 0.36 ppm, and hourly averages ranged to 0.12 ppm. Average sulfur dioxide concentrations were less than or equal to background 96% of the time at two sites, and 89% of the time at a third site. Aldehydes and hydrogen sulfide were not detected above background during the survey. (Authors' abstract)##

08161

Kalyuzhnyi, D. N., S. A. Davydov, L. G. Dukarskaya, and M. B. Aksel'rod

ATMOSPHERIC AIR POLLUTION WITH SULFUR DIOXIDE FROM MINING ROCK DUMPS. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 171-176, May 1960.
CFSTI: TT 60-21475

Emission of sulfur dioxide into the air was caused gy the oxidation of sulfur compounds present in dumped coal and waste rock. The intensity of waste rock burning in rock dumps and the quantity of sulfur dioxide liberated depended upon the chemical composition of the coal and the wasterock, the height of rock dumps, the duration of their accumulation meteorological conditions, etc. In mines with an intensive burning of waste rock and with high rock dumps increased concentrations of sulfur dioxide were found up to 1500 m from the source. In mines with low and slow burning dumps, diffusion of sulfur dioxide did not extend beyond 750 m. Sanitary clearance zones between rock dumps and residential quarters should be 500-1500 m wide, depending on the intensity of dumps' burning, the direction of prevailing winds, and the chemical composition of the coal and of the waste-rock. The method of filling in emptied coal veins, or ‖butovka,‖ should be put into wide practice in coal mining by organizations concerned with this problem. This should eliminate further dump heap accumulations. Waste rock should also be used for filling in of ravines. Extinguished dumps should be planted with appropriate shrubs and trees.

08267

DeCorso, S. M., C. E. Hussey, and M. J. Ambrose

SMOKELESS COMBUSTION IN OIL-BURNING GAS TURBINES. American Society of Mechanical Engineers, Paper 67-PWR-5, 8p., 1967. 14 refs. (Presented at the ASME-IEEE JOINT POWER GENERATION Conference, Detroit, Mich., Sept. 24-28, 1967.)

The smoke particles generated by gas turbines burning fuel oil are in the worst possible size category from the point of view of visibility. Because of the small size of these smoke particles, entrapment techniques involving internal separation, or washing will tend to be ineffectual. This is confirmed by the fact that laboratory tests showed no change in smoke level after passage proportions of air entry at various stages of the combustor. through a heavy coolant spray. Significant reduction in smoke level has been accomplished on a combuster design by changing the the proportions of air entry at various stages of the combustor. Certain additives have been found to be effective in reduction of smoke. They were most effective in producing a noticeable change in smoke level at the lower smoke numbers (i.e., at the lighter smoke levels). This reduction of additive effectiveness with increasing smoke may be rationalized on the basis that the action of the additive is reaction-rate limited. Some of the physical laws relating to visibility and transmissibility have also been briefly examined. No major effect of fuel type is thus far noticeable on our combustors over a rather broad range fuel type. ASM##

08297

Spinazzola, A., L. Marraccini, G. Devoto, and S. Zedda

DISTRIBUTION OF SEVERAL VOLATILE TOXIC PRODUCTS WHICH ARE INDICATORS OF AIR POLLUTION IN THE CITY OF CAGLIARI. NOTE I. NITROGEN DIOXIDE. ((Studio sul comportamento di alcuni prodotti tossici volatili quale indice di inquinamento atmosferico nella citta' di Cagliari. Nota I. Gli ossidi azoto.)) Text in Italian. Folia Med. (Naples), 49(8):569-579, Aug. 1966. 19 refs.

Measurements of the level of nitrogen dioxide were made at 18 locations from 8 A.M. to 8 P.M., from Dec. 1, 1965 to July 15, 1966. Selective samplers were placed 150 and 200 cm above street level at each monitoring location and sampled 60 l/hr of air. NO2 was present at levels ranging from 0.0018 to 0.0470 ppm. The highest level is seen at street corners with traffic lights (0.0470 and 0.0316 ppm) and in areas with congested traffic (0.0330-0.0200 ppm). Areas with light traffic did not exceed 0.0090 ppm. Levels generally reach a peak during rush hours. The results are compared with those from other studies in Naples, Milan, and Bologna. It is concluded that the probable source of NO2 is the combustion of diesel oil or gasoline.

08301

Bush, Albert F., Asce, M. and Nottage, H. B.

CARBON DIOXIDE AS AN INDICATOR OF AIR POLLUTION. Proc. Am. Soc. Civil Engrs., J. Sanit. Eng. Div., 93(SA6):211-253, Dec. 1967.

Carbon dioxide as an indicator of chemical air quality, its relationship to other indices of air pollution, and its characteristics in an urban atmosphere were investigated. Infrared CO2 analyzers were installed at the Continuous Air Monitoring

Program (CAMP) stations in San Francisco and Los Angeles. Data were obtained also from San Diego. Sufficient continuous data were obtained from March 1964 to Feb. 1965 from the Los Angeles analyzer to allow a comparative analysis of CO2 with other indicators measured by CAMP--CO, NO, NO2, Ox and SO2. Since all the data were obtained at the West Coast, SO2 concentrations did not reach sufficient intensity to be significant. The chemical and meteorological relationships of the above pollutants were also determined. Data from a mobile CO2 unit are presented as they relate to a freeway study, a residential heating study, and an ocean study. The results show that carbon dioxide is a good indicator of chemical air quality in the urban atmosphere. In absoute magnitude it indicates the levels of the other indices of air pollution. Seasonal norms of each variable are reflected in corresponding seasonal norms for CO2, and daily exposure patterns as well as diurnal patterns indicate approximate levels of other indices. The gross meteorological pattern of the atmosphere is also reflected in the daily build-up of CO2. Recommendations include a different layout for freeway construction to reduce air pollution, more rugged, simpler and fully automotive instruments for measuring CO2, and continuous measurement of atmospheric CO2 at Weather Bureau stations throughout the United States.

08327

Robison, Charles B., Frederick L. Meadows, and John J. Henderson

ALABAMA RESPIRATORY DISEASE AND AIR POLLUTION STUDY. II. AIR POLLUTION PATTERNS IN THE GREATER BIRMINGHAM AREA. Arch. Environ. Health, Vol. 15, p. 703-727, Dec. 1967. 22 refs.

In 1962, the Alabama Respiratory Disease and Air Pollution Study was initiated to determine the prevalence of various pulmonary disorders and to relate these findings to air quality data. This paper describes part of the aerometric effort begun in December 1963 in the Greater Birmingham Area. Samples for analysis of suspended particulate, dustfall, sulfation, and 24-hour gases (nitrogen dioxide, sulfur dioxide, and aldehydes) were collected routinely from 21 stations located primarily in residential areas. Annual cumulative frequency distributions for suspended particulate, dustfall, sulfation, nitrogen dioxide, and sulfur dioxide displayed a log-normal distribution. Aliphatic aldehydes were found to be normally distributed. Suspended particulate and dustfall levels were extremely high in certain locations throughout the area. The annual mean for suspended particulates from this network was 125 microgram/cu m, which is considerably higher than the national urban mean. Seasonal means at several stations often exceeded 200 microgram/cu m. The annual mean for dustfall was 22 tons/sq. mi/mo, which is higher than the annual mean reported in either Nashville or St. Louis. This annual mean reflects the influence of seven stations in very clean areas, which consistently reported seasonal means less than 15 tons/sq. mi/mo. Sulfation and sulfur dioxide levels showed similar seasonal patterns. For the entire network, both of these pollutants were found in relatively low concentrations. The annual mean for sulfation was 0.16 SO3/100 sq. cm/day, and for sulfur dioxide, 0.2 ppm. The nitrogen dioxide annual mean for

the 21 stations was 7.1 pphm, which is higher than levels found in most NASN cities. Seasonal means for nitrogen dioxide varied less than those for other gaseous pollutants. The annual mean for aliphatic aldehyde was 1.4 pphm. Aldehyde sampling has been done on a very limited basis in the United States and consequently no data are available to compare with these 24-hour concentrations. (Authors' summary) ##

08485

Masek, Vaclav

THE EFFECT OF SOLAR RADIATION ON THE PRESENCE OF 3,4-BENZOPYRENE IN INDUSTRIAL EXHAUSTS. ((Vliv slunecniho zareni na pritomnost 3,4-benzpyrenu v exhalacich.)) Text in Czech. Chem. Prumysl (Prague), 17(2):99-103, 1967. 30 refs.

The determination of polycyclic hydrocarbons in industrial exhausts and in the atmosphere has become increasingly important in recent years. The main interest is focoused on carcinogenic substances, particularly on 3,4-benzopyrene. In the present study, 3-4-benzopyrene was determined from samples obtained by passing air through filter paper in the vicinity of a coking plant in which coal tar products formed during carbonization leak into the atmosphere. At the same time the intensity of solar radiation was recorded with a Robitzsch pyranograph. The results showed that the intensity and duration of solar radiation had no effect on the content of 3,4-benzopyrene in the atmosphere and in the dust in the vicinity of the source. The discharge of tar products into the atmosphere must be controlled by changing the technology, e.g. by improving equipment seals and using steam injection to reduce the vapor pressure inside the equipment. Tables and graphs. ##

08722

Sandberg, J. S.

CONTAMINANT AND WEATHER SUMMARY, NOVEMBER 1967. Bay Area Air Pollution Control District, San Francisco, Calif. 3p. 1967.

A general description of the weather is presented. Daily mean wind speed, maximum temperature, sunshine, and ventilation are given. Oxidants, particulates, and carbon monoxide are discussed on a "day-by-day" basis. Daily carbon monoxide concentrations and oxidant concentrations are given for eleven areas in and around San Francisco. ##

09008

G. Jaccard, P. E. Pilet

STUDY OF THE ATMOSPHERIC POLLUTION IN THE CITY OF LAUSANNE. ((Etude de la pollution atmospherique de la ville de Lausanne.)) Institut de biologie et de physiologie vegetales

de l'Universite de Lausanne, 48p., ((1966)). Translated from French. Joint Publications Research Service, Washington D. C., R-8980-D, 48p., Jan. 16, 1968.

Measurements were conducted from October 1965 to September 1966 of sulphurous anhydride (SO2) and carbon monoxide. The analyses were completed by a systematic study of various sensitive biological tests in the presence of polluted air. SO2 was measured by two methods; gravimetric measurement and measurement by an automatic recording apparatus which measures electrical conductivity. Carbon monoxide was measured with the Uras apparatus, which measures infrared ray absorption. Biological tests were run by making measurements of pine needles and lentil seeds. Dust was measured with membrane filters, using gravimetric analysis. Germs were measured with the same apparatus used for dust, then seeded on solid culture medium. Results are tabulated. The titer of absorbed SO2 is much higher in winter than in summer. In summer, the diurnal SO2 titer is higher than the nocturnal titer. The CO titer varies during the day, the diurnal titer being almost double that of the nocturnal titer. No results are given for winter measurements. Those for summer are diagrammed. It is concluded that foreign gases are present in air currents from aeration openings and act on the growth and metabolism of the nearby pine needles and lentil plants. The dust titer was found to be relatively low in the city. The increase in total germ titer was in direct ratio with the occupation of work locations and of streets. A mobile laboratory is described.##

09018

Hess, W.

SUMMARY OF THE ATMOSPHERIC STUDIES IN THE CITY OF ZURICH BETWEEN 1961 AND 1965. Z. Praeventivmed. (Zurich), 11(2):144-156, 1966. 5 refs. Translated from German. Joint Publications Research Service, Washington, D. C., R-8942-D, 14p., Jan. 12, 1968.

Measurements of CO, SO2, and NOx concentrations were made at several important intersections of heavy traffic. Carboxyhemoglobin concentrations were measured in the blood of traffic officers and were correlated with CO measurements. The concentrations of the various pollutants fluctuated within a wide range and depended on the density of traffic and meteorological conditions.##

09209

Schuenemann, J. J.

ASSIGNMENT REPORT. AIR POLLUTION TEHERAN. AN INTRODUCTORY SURVEY OF THE PROBLEMS AND SOME SUGGESTED ACTIVITIES. World Health Organization, Geneva (Switzerland), 49p., Sept. 13-Oct. 1, 1965. 3 refs.

A project was begun in the city of Teheran which consisted of these two parts: 1. A short term study of the main recognized sources of air pollution in the city with the aim of identifying their causes and recommending appropriate technical and administrative measures for their abatement. 2. A long-term small scale study of air pollutants and their effects on the community with the aim of training staff and developing techniques for more intensive future studies. Information corresponding to these two parts is presented.##

09250

H. V. Ubisch, T. Nilsson

AN AIR POLLUTION STUDY IN STOCKHOLM 1963/1964 AND 1964/1965. ((Luftfororeningsundersokningarna i Stockholm 1963/1964 och 1964/1965.)) Text in Swedish. Nord. Hyg. Tidskr., 48(1):13-16, 1967. 3 refs.

At the centrally situated church of St. Clara, in Stockholm, SO2, NO2, and air-borne dust levels were monitored at 3 different levels above ground. The accompanying figures show, for SO2, weekly means, cumulative frequency distributions for 2-hr. values, annual variations expressed in monthly means, and an example of the correlation between the wind direction and the pollution level. Air pollution is high in downtown Stockholm, ranging from traces of SO2 in the summer months, to almost 15 p.p.h.m. during December-Janurary. The ordinary height for smoke stacks may be unacceptable.##

09268

Aldaz, Luis

SURFACE AIR RADIOACTIVITY AND OZONE AT AMUNDSEN-SCOTT STATION (90 deg. S.), ANTARCTICA. Nature (Paris), 215(5102):722-723, Aug. 12, 1967.

Two ambient atmospheric tracers were studied. Ozone was measured by two types of instruments, a chemiluminescent device, and a wet chemical detector: airborne radioactivity (fission products) was also continuously measured. The monthly means of the ozone measurements from 1962 to 1965 and of the radioactivity measurements from 1959 to 1965 are graphically illustrated. The radioactivity and ozone levels show a yearly oscillation; the respective oscillations are opposite in phase. The phase difference noted at the South Pole differs from that previously reported for the middle lattitudes of the northern hemisphere where the time difference between the seasonal maxima for the same two tracers is approximately one month, with the radioactivity peak lagging.##

09280

Public Health Service, Washington, D. C., National Center for Air Pollution Control, and Health Research Council, New York, N. Y.

SURVEY OF AIR MONITORING ACTIVITIES IN NEW YORK METROPOLITAN AREA. 70p., Dec. 1, 1967.

This survey took place during the period January 9-27, 1967. The consolidated Edison Company of New York, the Interstate Sanitation Commission, the Long Island Lighting Company, the State of New Jersey, N. Y. City Department of Air Pollution Control, N. Y. University, Public Service Gas and Electric Company (N. J.), Nassau and Westchester Counties, and the U. S. Public Health Service were included. The pollutants measured were: sulfur dioxide, carbon monoxide, oxides of nitrogen, hydrocarbons, oxidants, hydrogen sulfide and aldehydes. Summaries of the monitoring activities of the various agencies measuring specific pollutants are tabulated. These contaminants have been arbitrarily classified into three classes; each of which are discussed from the standpoint of physical or chemical properties and the method used for their collection. The purpose was to provide a current appraisal of air monitoring activities in the greater New York Metropolitan area as of July 1, 1967.##

09391

Spinazzola, A., L. Marraccine, L., and G. Devoto

FIRST OBSERVATIONS ON AIR POLLUTION IN THE CITY OF CAGLIARI. BEHAVIOR OF NITROUS VAPORS AND OF AMMONIA. (Primi rilievi sull' inquinamento atmosferico della citta' di Cagliari. Comportamanto dei vapori nitrosi e dell'amoniaca.) Text in Italian. Rass. Med. Sarda, 69(4):295-300, 1966.

Hourly air samples of 60 liters are taken from 8:00 A.M. to 8:00 P.M. at 4 test sites in Cagliari. The nitrous oxides were detected using the Saltzman method; the ammonia levels were detected using the Jacobs method. Levels of nitrous oxides ranged from 0.002 to 0.060 p.p.m., with peaks from 8:00-9:00 A.M., noon to 2:00 P.M. and from 7:00-8:00 P.M. Levels of ammonia ranged from 0.088 to 0.400 p.p.m. with no detectable diurnal peaks.

09404

Damilano, S.

LEVELS OF SULPHUR DIOXIDE REGISTERED IN BOLOGNA DURING THE WINTER 1965-1966, BY MEANS OF THOMAS AUTOMETER. ((Livelli di anidride solforosa registrati a Bologna nell'inverno 1965-1966 mediante l' autometro di Thomas.)) Text in Italian. Nuovi Ann. Igiene Microbiol. (Rome), 17(5):415-419, Sept.-Oct. 1966. 7 refs.

Continuing a ten-year program for the study of air pollution in Bologna, measurements using the Thomas Autometer were carried out from October 1965 through April 15, 1966. According to the results, expressed in terms of sulphur dioxide levels, air pollution in the city reaches a peak (up to 0.65 SO2 units) during the wintertime and is highest in the absence of precipitation or during low temperatures. Its exclusive source is domestic heating. On the whole, air pollution is not yet a problem for this city.##

09445

Comprehensive Planning Bureau, Japan, Osaka Municipal Office

AIR OVER OSAKA CITY. 93P., 1967

The location, geographical features, population, manufacturing, and administration of Osaka City are discussed. An extensive discussion of the measurement of air pollution is presented. The sampling networks and measurement of dustfall, sulfur dioxide, suspended particulate matter, automobile exhaust gases, and meteorological parameters are discussed in detail. A survey of air pollution sources in Osaka City is summarized.##

09467

Rosen, J. M.

SIMULTANEOUS DUST AND OZONE SOUNDINGS OVER NORTH AND CENTRAL AMERICA. Minnesota Univ., Minneapolis, School of Physics and Astronomy, Contract Nonr-710(22), AP-25, 219p., Aug. 1967. ((56)) refs.
CFSTI, DDC: AD 658546

Simultaneous soundings of ozone and sub-micron dust over North and Central America are reported. The results show considerably more dust in the equatorial stratosphere than in the middle latitude stratosphere. The relative maximum in the dust concentration observed near the level of the tropopause and as far north as 60 deg. is attributed to an equatorial dust source. The occasional appearance of a secondary dust maximum immediately above the mid-latitude tropopause is attributed to a form of transport other than that of eddy diffusion. The structure in the ozone and dust profiles appears to be highly correlated in the lower mid-latitude stratosphere. A quantitative model is presented describing the production and transport of dust in the stratosphere. The methods and equipment employedare described. Theoretical vertical and horizontal diffusion models are also considered in detail.##

09577

Craxford, S. R. and M. L. P. M. Weatherly

AIR POLLUTION IN GREAT BRITAIN - PAST, PRESENT AND FUTURE. (ORIGINAL SCIENTIFIC PAPER.) Preprint, Warren Spring Lab.,

Stevenage, U. K., Ministry of Technology, 20p., 1966. (Presented at the 36th International Congress of Industrial Chemistry, Brussels, Sept. 1966.)

The distribution of the major air pollutants - grit and dust, smoke, and sulphur dioxide - throughout Great Britain is examined in relation to the pattern of emissions, and trends over the past decade and more have been worked out. Using this material as a basis, estimates can be made of the further improvements that can be brought about in the next few years. Much of the data used were obtained from the National Survey of smoke and sulfur dioxide, which is described in detail.

09590

Public Health Service, Washington, D. C., National Center for Air Pollution Control

PARKERSBURG, WEST VIRGINIA, MARIETTA, OHIO AIR POLLUTION ABATEMENT ACTIVITY. 87p., March 1967. ((38)) refs.

An investigation of air pollution in the interstate area encompassing Mariette, Ohio, Parkersburg, West Virginia, and Vienna, West Virginia was conducted. The average concentrations of suspended particulates measured in the three major population centers was in excess of 150 micrograms per cubic meter with maximum daily values in excess of 500 micrograms per cubic meter. The average value for 2-hour sulfur dioxide measurements made at three locations was approximately 0.02 part per million parts of air. At the Vienna station, however, a daily average concentration of 0.10 part of sulfur dioxide per million parts of air was exceeded 3.4 percent of the time. Short-term concentrations approached one part sulfur dioxide per million parts of air at various times. Sensitive vegetation exposed in Vienna developed injury that was attributed to the synergistic action of ozone and sulfur dioxide in low-level combination. Damage to indigenous vegetation from sulfur dioxide and fluorides was also observed. Atmospheric corrosion of ferrous metals was not abnormally high. Tarnishing of silver plate indicated, however, that the presence of gaseous sulfides is consistent with reported complaints of odor nuisance. From an inventory of emissions of sulfur oxides and particulate pollutants it is estimated that more than 123,000,000 pounds of sulfur oxides and 25,000,000 pounds of particulate pollutants are emitted each year from sources in the survey area. Approximately 85 percent of the sulfur oxide and 55 percent of the particulate matter are emitted from sources in Ohio, and 15 percent of the sulfur oxides and 45 percent of the particulate matter from sources in West Virginia. Eight point sources account for almost 98 percent of the total sulfur oxides and 94 percent of total particulate emissions. Mathematical applications of diffusion theory were used to estimate the relative contributions of specific sources.

09598

Lonneman, W. A., T. A. Bellar, and A. P. Altshuller

AROMATIC HYDROCARBONS IN THE ATMOSPHERE OF THE LOS ANGELES BASIN. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((22))p., Jan. 1968. 18 refs.

Gas chromatographic analyses for aromatic hydrocarbons were made in Los Angeles during the fall of 1966. A concentration technique permits analysis for hydrocarbons ranging from benzene to ten-carbon aromatics. These measurements make it possible to relate the levels of aromatic hydrocarbons to atmospheric photochemical reactivity. Concentrations of aromatics averaged 0.106 ppm during this period; the maximum concentration was 0.33 ppm. Toluene, the most abundant aromatic hydrocarbon, constituted 35 to 40 percent of the total concentration of aromatics. The more reactive dialkyl- and trialkylbenzenes constituted 40 percent of the aromatics measured. Ratios of many of the aromatic hydrocarbons to each other varied considerably within the same day as well as on different days. Analysis of the ratios suggested a significant contribution from solvent losses. Ratios of hydrocarbon to nitrogen oxides were related to the observed oxidant concentrations. (Authors' abstract)##

09743

Roberts, D. P.

SHORT TERM COMMUNITY AIR POLLUTION STUDIES IN TENNESSEE. Occupational Health Rev. (Ottawa), 19(1-2):11-15, 1967. 3 refs.

Short-term studies of air pollution in eight Tennessee towns selected on the basis of geographic location and population - less than 40,000 people are described. The studies indicated that at least some of the towns had significant levels of particulate air pollution as measured by weight of such particulates and by soiling potential of the particles. It was also found that the gaseous pollutants measured were of no immediate concern in towns of this size. (Author's abstract, modified)##

11028L

Colucci, Joseph M. and Charles R. Begeman

CARCINOGENIC AIR POLLUTANTS IN RELATION TO AUTOMOTIVE TRAFFIC IN NEW YORK. Preprint, General Motors Research Labs., Warren, Mich., Dept. of Fuels and Lubricants, RP-GMR-777, 32p., 1968. 33 refs. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-71.)

Sampling for particulates and carbon monoxide was carried out at
tions of certain polynuclear aromatic hydrocarbons (benzo(a)pyrene
and benz(a)anthracene) to automobile traffic. Carbon monoxide
and lead were determined as indicators of air pollution from auto-
motive combustion sources. Sampling equipment was contained in a
step-van truck. Particulate matter was collected on a large "ab-
solute" filter. The benzene extract (tar) was analyzed for benzo
(a)pyrene and benz(a)anthracene utilizing column and reversed-
phase paper chromatography in combination with ultraviolet spectro-
photometry. The average concentrations of all pollutants were
highest at Herald Square in central Manhattan, and lowest in
suburban Scarsdale. Concentrations of benzo(a)pyrene ranged from
0.1 micrograms/1000 cu m to 9.4 micrograms/1000 cu m, were higher
in daytime than at night, and were highest in autumn and winter.
For all sites considered together, the correlation coefficient of
benzo(a)pyrene with carbon monoxide was 0.65, with lead, 0.74, and
vanadium 0.54; all three correlations were statistically non-zero
with 99% confidence. At individual sites, however, some of these
correlation coefficients were significant and others were not.
Benzo(a)pyrene, in air, even in areas of greatest automobile
traffic, appears related with both automotive and non-automotive
sources (space heating). Benzo(a)pyrene concentrations at the
Manhattan sites in New York were lower than previously measured
in central Detroit, even though traffic was greater at the New
York sites. BaP in New York was lower than reported for most
U. S. cities, and more than reported for several European
cities.

11224

Venezia, R. and G. Ozolins

INTERSTATE AIR POLLUTION STUDY PHASE II PROJECT REPORT. II.
AIR POLLUTANT EMISSION INVENTORY. Public Health Service,
Cincinnati, Ohio, National Center for Air Pollution Control,
50p., Dec. 1966. ((50)) refs.

An emission inventory was conducted during 1963-1964 as part of
the St. Louis - East St. Louis Interstate Air Pollution
Study. The Study covered an area of 3,567 square miles and
included the City of St. Louis and the six surrounding
counties - St. Louis, St. Charles, and Jefferson Counties in
Missouri and Madison, St. Clair, and Monroe Counties in
Illinois. More than 95 percent of the population and almost all
of the industrial activity are located in the 400 square miles of
the centrally located urbanized part of the Study area. The
pollutant emission data presented can be almost entirely attributed
to this urbanized portion of the area. Population density and
land-use maps, which provide an excellent index to the areal
distribution of most pollutant emissions, are presented. The
pollutants considered in this survey are those emitted in large
quantities from a variety and multitude of sources dispersed
throughout the area. Included are aldehydes, carbon monoxide,
hydrocarbons, nitrogen oxides (calculated as nitrogen dioxide),
sulfur oxides (calculated as sulfur dioxide), particulates, and
benzo(a)pyrene. The emissions of other pollutants are generally
associated with a specific process or operation and in general, are
not distributed throughout the community. (Authors' abstract,
modified)##

11267

Public Health Service, Cincinnati, Ohio, Div. of Air Pollution.

FOUR-YEAR SUMMARY OF DATA FROM THE CONTINUOUS AIR MONITORING PROGRAM.
Preprint, ((23))p., Aug. 1966.

Continuous air monitoring data gathered during 1962 - 1965 is summarized. Ambient atmospheric concentrations of six gaseous air pollutants from several major american cities are given. These include sulfur dioxide, nitric oxide, nitrogen dioxide, total oxidants, total hydrocarbons, and carbon monozide, and sailing index values. Summaries by city and year are given of the annual average concentrations, the maximum and minimum monthly average concentrations, and the maximum daily average concentration of the several pollutants monitored.##

11353

Public Health Service, Durham, N.C., National Air Pollution Control Administration

AIR QUALITY DATA FROM THE NATIONAL AIR SAMPLING NETWORKS AND CONTRIBUTING STATE AND LOCAL NETWORKS 1966 EDITION. NAPCA-Pub-APTD-68-9, 157p., 1968.

Summaries and analyses in addition to basic data tabulations are presented. National summaries of pollutant levels, and figures illustrating variations in the levels of gaseous pollutants are presented. Data are given on the following topics: suspended particulates; organic particulates; radioactivity; nonmetallic inorganic particulates; metals; soiling index; gaseous pollutants; and measurement from the Colorado State network.##

11459T

Shirai, Toshiaki, Shuichi Hamada, Hiromi Takahashi, Toshihiro Ozawa, Takao Omuro and Takashi Kawakami

PHOTOCHEMICAL OXIDATION OF SULFUR DIOXIDE IN ATMOSPHERE. Translated from Japanese. Kogyo Kagaku Zasshi, Vol. 65, p. 1906, 1962. 20 refs. (Presented at the 15th Annual Meeting of the Japanese Chemical Society in April, 1962).

The concentration distribution of SO2 and total oxides of sulfur in the area of ZnO smelting plant in Yamakata Ken were determined. The concentration ratio of SO2 to total sulfur oxides decreased with increasing distance. This clearly indicated that SO2 was oxidized in the atmosphere. The intensity ratios of solar radiation measured in fine weather in the ZnO and Tokyo areas agreed extremely well in the range of the wavelength

400 mu to 320mu. However, there was a big difference below 320mu. From experiments with a mercury lump it was found that the photochemical oxidation of SO2 was a first order reaction and that the rate constant increased with an increase in atmospheric moisture. Parameters tabulated for 10 to 32 different measurement locations include: concentration of SO2 and of total sulfur oxides; temperature; wind direction and speed; weather; and correlation of total sulfur oxides with distance from the slag dump pollution source.##

11615

Nowakowski, Paul

LUMINESCENT SMOKE GENERATION FEASIBILITY STUDY (FINAL REPORT). Missouri Research Labs., Inc., St. Louis, Mo., Contract N61339-67-C-0095, Task 5709, NAVTRADEVCEN 67-C-0095-1, 25p., May 1968.
CFSTI: DDC AD 675503

The methods, test results and conclusions that comprise the effort of expanding the potential of a smoke generating device into the realm of fluorescent response are described. In order to satisfy the requirements generated in this task, several areas of investigation were included in this program. To determine sources of fluorescent response and to ascertain the state of the art, literature was surveyed. The next step involved a study of the smoke generating device to determine the potential and the limitations of the smoke generating mechanism. When the most promising candidates for fluorescence had been procured, they were tested in the apparatus varying the solvent and the concentration. This physical testing prompted further work, using procured and tested and when the most promising formulations were ascertained, the stability of the fuel and the characteristics of the smoke cloud were determined. The forments. (Author's summary, modified)##

11627

Lahmann, Erdwin, Juergen Westphal, Kurt Damaschke, and Margot Luebke

CONTINUOUS OZONE MEASUREMENTS IN A HEAVILY TRAVELLED STREET. (Kontinuierliche Ozon-Messungen in einer verkehrsreichen Strasse). Text in German. Gesundh. Ingr., 89(5):144-147, 1968. 12 refs.

At two measuring stations in Berlin, continuous ozone measurements were taken from the summer of 1966 to the summer of 1967. The first measuring station was located in a busy street in Berlin Steglitz. The air samples were taken at 20 m and sometimes also at 2 m. The second station was in a quiet area without traffic; the samples were taken at 10 m. The results show that in the busy Schlosstrasse, maximum ozone concentration was about 5 pphm. Of the total number of individual measurements, 8.6%

exceeded 1 pphm and only 2% exceeded 2 pphm. The maximum daily average was 3.2 pphm. Higher ozone concentrations were measured in summer than in winter. The average ozone concentrations in the traffic-free area were much higher than those in the busy street. Comparison of the diurnal variations of ozone concentration at the two stations clearly shows the influence of traffic. In the traffic-free area, the ozone concentration rises from a maximum between 5 and 6 a.m. to a maximum between 2 and 3 p.m. and gradually subsides again. In the busy Schlosstrasse, the ozone concentration drops to a minimum between 7 and 8 a.m. At this time, which coincides with the morning rush hour, the ozone concentration was just half as high as that in the traffic-free area.

11775

S. S. Brar, D. M. Nelson, P. F. Gustafson

MEASUREMENT OF OZONE IN SURFACE AIR AT ARGONNE NATIONAL LABORATORY. In: Biological and Medical Research Division Annual Report 1968. Argonne National Lab., Ill., ANL-7409, p. 290-291, Dec. 1967. 4 refs.
CFSTI: TID-4500

Ozone studies in ground level air were initiated as part of the Environmental Studies Program at Argonne, Illinois. A recording, ozone-sensing meter detects ozone by oxidation of potassium iodide. Figures and tables give the daily average values of ozone at Argonne in parts per billion against time in days from mid-May to mid-September 1967. The data are too limited to allow a correlation with meteorological variables or to identify any seasonal variations. Typically, ozone concentration in air begins to rise early in the morning, builds up to a maximum past mid-day, and falls to a low level by evening, where it remains through the night.##

12147

Nader, John S.

CONTINUOUS GAS MONITORING OF URBAN AIR BY THE U.S.P.H.S. Preprint, Instrument Society of America, Pittsburgh, Pa., 9p., 1961. 7 refs. (Presented at the Instrument Society of America Instrument-Automation Conference, Los Angeles, Calif., Sept. 15, 1961.)

In September 1961, the U. S. Public Health Service initiated a program of continuous gas monitoring of urban air. Objectives of the program were to obtain information on the effects of gaseous emissions from auto exhaust on the health of persons in a large urban area and to determine optimum frequency sampling and duration of sampling intervals. Data was provided by stations in Chicago, Cincinnati, New Orleans, Philadelphia, San Francisco, Washington, D. C., Los Angeles, and Detroit. The stations were located as close as possible to the center of each city's business district; at each station, ambient air was sampled within 10 to 15 ft above ground

level. Identical instrumentation has been selected for the cities to eliminate instrument difference as a varying parameter. Colorimetric analyzers are specified for nitri oxide, nitrogen dioxide, and total oxidants; conductometric for sulfur dioxide, coulometric for 03, infrared for carbon monoxide; and flame ionization for hydrocarbons. Analytical data obtained in monitoring are presented in the form of continous strip-chart recordings. To overcome the problem of handling strip-chart data, a digital punch-tape recorder has been incorporated with each strip-chart recorder.

12360

Massachusetts Dept. of Public Health, Boston, Air Use Management Program

SPECIAL REPORT ON THE INVESTIGATION AND STUDY OF AIR QUALITY IN THE METROPOLITAN (BOSTON) AIR POLLUTION CONTROL DISTRICT 1965-1966 UNDER CHAPTER 89 OF THE RESOLVES OF 1964. 141p., Sept. 16, 1968. 22 refs.

Atmospheric contamination in the Boston metropolitan area was intensively investigated by the Massacusetts Department of Public Health. The principle aims of the study were to determine the sources, extent, and nature of atmospheric contaminants in Boston and its surrounding communities; the variation in concentration of the contaminants with respect to time, location, topography, and meteorological variables; the effects of such pollution; the types, locations, and strengths of significant emission sources; and the requirements of a continuing program of atmospheric monitoring and air pollution control All sampling measurements are presented in the form of tables and bar diagrams. Means for reducing the potential for occurrence of pollution levels of certain contaminants are discussed.

12649

W. H. Cock

AIR POLLUTION MEASUREMENTS IN AUSTRALIA. A SURVEY OF CURRENT METHODS AND DEVELOPMENTS. Clean Air (J. Clean Air Soc. Australia, New Zealand), 2(3):10-13, Sept. 1968. 9 Refs.

Air pollution measurements in Australia are at present restricted almost solely to deposit gauge and smoke and sulphur dioxide surveys. These are being carried out to an appreciable extent in only three States, viz. New South Wales, Victoria and South Australia. The deposit gauge is considered as a tool for first order of magnitude measurements only. It sould therefore be replaced by instruments, the results from which can be correlated, on a daily basis at least, with meteorological data for the more easy identification of source pollution. Such an instrument is being used by the Shire of Altona in Victoria. (Author's Summary##)

14180

Gordon, Robert J., Henry Mayrsohn, and Raymond M. Ingels

C2-C5 HYDROCARBONS IN THE LOS ANGELES ATMOSPHERE. Environ. Sci. Technol., 2(12):1117-1120, Dec. 1968. 12 refs.

A joint study was carried out in Los Angeles in the fall of 1967 to define more closely the actual concentration of oxides of nitrogen and various hydrocarbons in the atmosphere on days of differing smog intensity. Part of the study involved gas chromatographic analysis for light hydrocarbons, ethane to isopentane, at two sites. Almost 700 samples were run during 46 days. Averages were presented for the hourly samples subdivided into groups of high or low oxidant development. Light paraffins, especially propane, were found in concentrations too high to be ascribed to auto exhaust, but their source was not pinpointed. The average morning concentration of oxidant at various locations was closely similar, hour by hour, in spite of large differences in the levels of primary pollutants. The ratios of acetylene and high olefins to nitrogen oxides were found to be higher than the average in exhaust generated in a test cycle on a dynamometer.

14534

COMMISSION ON EARTH, WATER AND AIR, ROTTERDAM. Annual Report 1968. (Verslag over het jaar 1968). Text in Dutch. 72p.

This report deals with the soil, water, and air pollution problems in the vicinity of Rotterdam. Thirty-three cases of soil pollution reported in 1968 were mainly due to leakage in underground tanks and pipes. The average chlorine content at low tides at the measuring station of the Horingerdijk reservoir was 139 mg/l, 7 mg/l lower than in 1967. The level of air pollution during 1968 was more or less constant in comparison with 1967. A study of the 1218 bronchitis complaints of male civil servants indicated that bronchitis occurs with increasing frequency in the age group above 40 and especially above 60. A study of chronic bronchitis and asthma in elementary school children in two sections of Rotterdam indicated that in Crosswijk, 5.5% of 455 children had chronic bronchitis and 2.2% had asthma. In Hillegersberg, 1.0% of 480 children had chronic bronchitis and 1.7% had asthma. Measurements of precipitation, smoke, polycyclic hydrocarbons, CO, ozone, NO2, and sulfur oxides are presented. The smoke meter results show a usual smoke content of 100 micrograms/cu m or more during long periods of mist which occur during the winter months. In the first and fourth quarters, the polycyclic hydrocarbon values were much smaller than those of 1964. Of 174 samples of carbon monoxide, 18 were more than 30 ppm; in 1967, only one sample was higher than 30 ppm. The highest lead content was 1.5 micrograms/cu m. Ozone content of the air was less than 20 micrograms/cu m on cloudy days. Nitrogen oxide concentration ranged from 100-150 micrograms/cu m. Ninety-one days were recorded with SO2 content equal to or greater than 350 micrograms/cu m, and 89 days were recorded with smoke content equal to or greater than 250 micrograms/cu m. The declining tendency for smoke pollution was attributed to the increasing use of natural gas.

14776

Lahmann, Erdwin

STUDIES OF AIR POLLUTION CAUSED BY MOTOR VEHICLES. (Untersuchungen ueber Luftverunreinigungen durch den Kraftverkehr). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 28, 80p., 1969. 123 refs.

A measuring station for determining the extent of air pollution caused by motor vehicles was erected in front of the city hall in West Berlin, considered to be the busiest point in the city. The Uras infrared analyzer was used for continuous measurement of CO and CO2 concentrations 75 cm above the ground; ozone was continuously measured at 2 and 20 m with a unit developed by Damaschke und Luebke based on liberation of bromine from a potassium bromide solution by ozone. For continuous measurement of hydrocarbons at 75 cm, a Beckman 109A analyzer was used. Discontinuous sampling was employed for measurement of NO, SO2, formaldehyde, and phenols. A high volume sampler was used for determination of the total dust concentration. Traffic counts were conducted throughout the measurement period, and the driving cycles were determined. The results are listed in detail in numerous tables and diagrams. The influence of meteorological factors such as wind direction and speed, humidity, temperature, and pressure is discussed. The maximum half-hourly average CO concentration was 60 ppm with concentration peaks in the morning and afternoon rush hours. Maximum CO2 concentration was somewhat less than 500 ppm and thus only 50% higher than the natural CO2 concentration of the atmosphere. No dangerous ozone concentrations were measured. All NO2 concentrations were below 0.2 mg/cu m. Peak SO2 concentrations occurred in between rush hours, which indicates that they are due to domestic heaters. A linear relationship between the various pollutants was found. The results of these measurements are compared with results in the literature.

15161

Yamate, Noboru

SUMMARY OF AIR POLLUTANTS LEVELS IN THREE AIR MONITORING STATIONS IN TOKYO, 1968. (Tokyotonai 3 chiten no taikiosen sokuteimo sokutei kekka no gaiyo). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 7(3):45-61, Oct. 1969.

Outlines of numerous figures, charts, and indices obtained by the air monitoring stations at three locations in Tokyo from January to December of 1968 are reported. The purpose of these monitoring activities was to determine exact and accurate pollutant levels in conjunction with traffic situations at the three monitoring station points. Measurements were made of seven pollutants using an automatic recorder. The tested pollutants were SO2, carbon monoxide, NO, NO2, dusts, formaldehyde, and total oxides; traffic situation was recorded simultaneously.

The average values measured were classified into hourly, daily, monthly, and yearly rates, and each maximum and minimum rate was reported. The relationship between traffic status and pollutant levels was obtained by the regression expression method. The quantities of CO, SO2, and HCHO showed the existence of a relationship, but NO2 and atmospheric dust did not show a particular relationship. The interrelationship between each pollutant level is reported and summarized. The general tendency of the pollutant levels determined for the past five years showed that both carbon monoxide and atmospheric dust were increasing, while nitrogen oxides remained almost the same and SO2 decreased.

15173

Tonomura, Masaharu, Nobuo Yamate, and Kusuo Tsuji

OBSERVATIONS OF AIR POLLUTION WITH THE AID OF AUTOMATIC CONTINUOUS ANALYSERS. II. RELATIONSHIP AMONG THE CONCENTRATIONS OF VARIOUS KINDS OF POLLUTANTS IN ATMOSPHERE. (Renzoku sokutei kirokukei ni yoru taiki osen no kenkyu (dai 2 ho) Taikichu ni okeru osenbutsu kan no sokan kankei ni tsuite). Text in Japanese. Eisei Shikensho Hokoku (Bull. Natl. Inst. Hyg. Sci., Tokyo), no. 85:35-40, 1967. 4 refs.

In a study conducted from January through December in 1964, air pollution in Tokyo was determined. The relationships between the concentrations of various kinds of pollutants, such as CO, SO2, NO, NO2, and dust particles, were determined as a function of their concentrations in the air. The pollutants were collected in three heavy traffic areas in Tokyo: Kasumigaseki, Itabashi, and Shinjuku. A previous survey indicated that a relationship might exist among the atmospheric contaminants originating from automotive exhaust gases. To evaluate this possibility, correlation coefficients between the concentrations of CO-SO2 and CO-NO were calculated using data from the automatic and continuous analyzers. The correlation coefficients revealed that a nearly perfect linear relationship exists between both sets of contaminants. For CO-NO2 and SO2-NO2, no significant relationships could be obtained. It was concluded that formulas could be used to estimate the concentrations of some pollutants, primarily those originating from automotive exhaust gases. (Author abstract modified)

15212

Gibson, J. A. B., J. E. Richards, and J. Docherty

NUCLEAR RADIATION IN THE ENVIRONMENT - BETA AND GAMMA-RAY DOSE RATES AND AIR IONIZATION FROM 1951 TO 1968. J. Atmospheric Terrest. Phys., 31(9):1183-1196, Sept. 1969. 33 refs.

The dose rates and air ionization due to beta and gamma radiation were measured continuously over open grassland at Grove, Berkshire, England from 1961 to 1968. The measurements are compared to the dose rates calculated from the radioactivity deposited from nuclear

weapon tests for the purpose of estimating dose rates back to 1951. These data are required for estimating possible biological effects on man and for studies of the electrical potential gradient in the atmosphere. Dose rates from natural sources were also considered and calculations and measurement of dose rates from cosmic rays, radioactivity in the soil and the air are included. The results from gamma radiation from fallout at 1 meter show a good correlation between measurement and calculation. The maximum dose rates occurred soon after the weapon tests of 1958, 1961, with levels up to 3.6 microrads/hr. The corresponding maximum levels for beta radiation at 1 meter were 40 microrads/hr. These levels must be modified to allow for attentuation by clothing before they can be applied to man, but the ionization of the atmosphere can be directly related to the potential gradient. The corresponding natural levels are 3.4 microrads/hr for cosmic rays, 3.7 microrads/hr for gamma radiation from air and soil, 1.4 microrads/hr for beta radiation, and 1.4 ion pairs/cc/sec for alpha radiation in air. The total natural ionization at Grove is 7.7 ion pairs/cc/sec. These calculations may be applied to other locations by allowing for the differences in the radioactive content of the ground and air, barometric pressure (cosmic radiation), latitude (cosmic radiation and fallout), and rainfall (fallout). (Author abstract modified)

15557

Lahmann, Erdwin, Juergen Westphal, Kurt Damaschke, and Margot Luebke

CONTINUOUS OZONE MEASUREMENTS IN A HEAVILY TRAVELLED STREET. (Kontinuierliche Ozon-Messungen in einer verkehrsreichen Strasse). Text in German. Gesundh. Ingr., 89(5):144-147, 1968. 12 refs.

At two measuring stations in Berlin, continuous ozone measurements were taken from the summer of 1966 to the summer of 1967. The first measuring station was located on a busy street in Berlin Steglitz. The air samples were taken at 20 m and sometimes also at 2 m. The second station was in a quiet area without traffic; the samples were taken at 10 m. The results show that in the busy Schlosstrasse, maximum ozone concentration was about 5 pphm. Of the total number of individual measurements, 8.6% exceeded 1 pphm and only 2% exceeded 2 pphm. The maximum daily average was 3.2 pphm. Higher ozone concentrations were measured in summer than in winter. The average ozone concentrations in the traffic-free area were much higher than those in the busy street. Comparison of the diurnal variations of ozone concentration at the two stations clearly shows the influence of traffic. In the traffic-free area, the ozone concentration rises from a minimum between 5 and 6 a.m. to a maximum between 2 and 3 p.m. and gradually subsides again. In the busy Schlosstrasse, the ozone concentration drops to a minimum between 7 and 8 a.m. At this time, which coincides with the morning rush hour, the ozone concentration was just half as high as that in the traffic-free area.

15610

Odaira, Toshio

AIR POLLUTION FROM MOTOR VEHICLE GASES IN TOKYO AND OSAKA. (Dai toshi ni okeru jidosha haiki gas ni yoru taiki osen no jittai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(5):337-353, 1969. 17 refs.

Various pollutant concentrations were determined near highways and surrounding areas in Tokyo and Osaka. A large amount of carbon monoxide was found near the highways, and gradually decreased in the surrounding areas. The difference in the height of the pollutant between the highway and surrounding areas could not be measured to 100 m if the wind was slow and natural convections occurred. The carbon monoxide concentration was found to be related to traffic density. The four pollutant patterns differed from each other in the dust content, sulfur dioxide and nitrogen dioxide content, carbon monoxide and nitric oxide content, and ozone content. The average CO was 3 to 8 ppm/yr; however, 40 to 50 ppm/hr was not rare. In the middle of the city, over 10 ppm/hr was measured 27% of the time. In the districts that were 100 to 200 yards from the highway, the monthly average was 5 to 6 ppm, but 30 to 50 ppm/hr sometimes occurred. In winter, this became serious. Nitric oxide concentrations were 0.05 to 0.25 ppm along the highway; NO2 was estimated to be less than 0.05 ppm. For the surrounding districts, NO was 0.05 to 0.15 ppm in winter and 0.01 to 0.05 ppm in summer. Hydrocarbons averaged 2 ppm/mo along the highway. Carbon monoxide, NO, and the hydrocarbon concentration curve changed during the day. Oxidants averaged 0.02 to 0.06 ppm/mo and sometimes 0.14 to 0.25 ppm/hr. These measurements reveal that photochemical smog is important in Tokyo. Lead was 3 to 9 mg/cu m along the highway and 0.7 to 5 mg/cu m in the surrounding districts.

15726

Eichmeier, J.

THE VARIATION OF THE NATURAL SMALL AND LARGE ION CONCENTRATION INDOORS. (Das Verhalten der natuerlichen Klein - und Grossionenkonzentration in geschlossenen Raeumen). Text in German. Intern. J. Biometeorol., 13(1):51-60, 1969. 20 refs.

The small and large ion concentration was measured in a normal room with open or closed windows, in a windowless room, and in a windowless metal shielded room. A particle counter and a dot recorder were used. In the first room, the large ion concentration was higher by an open window, fluctuating between 500 and 8000 l/cu m. It was at a maximum in the morning and afternoon, and subsided over the weekend. The maximum value coincided with the higher air pollution caused by the morning and afternoon traffic rush hours. The small ion concentration was higher by a closed window. In the windowless room, the small ion concentration was on the average somewhat higher than in the room with windows; the large ion concentration was lower. When

the door of the room was open, the large ion concentration increased; the small ion concentration decreased. In the metal screened room, the small ion concentration was three times as large as in the open air. Opening the door for a longer period of time increased the large ion concentration.

15740

Stewart, W. S. and D. H. Wilken

EFFECT OF SHADE ON ATMOSPHERIC OXIDANTS (SMOG). Preprint, 11p., 1966?. 10 refs.

Experiments were conducted to compare simultaneously smog oxidant level in sunlight and under shade. In one series of experiments, air samples taken from a cardboard box and a glass jar were compared to those taken outside the shade chambers. In other experiments, samples were taken simultaneously from the glass chamber and from under the leaf canopy of a Bougainvillea vine or Alibizzia julibrissen tree. In comparison to sunlight, oxidant reduction occurred in all samples taken from shade chambers and was also observed in the shade under plant canopy. The highest reduction was observed in the cardboard box, presumably because of its greater volume. Observed differences in the oxidant level between sun and shade were relatively unaffected by temperature, but presumably affected by breezes and air movement. The data suggest that undesirable effects of smog on vegetation can be reduced by the planting of shade trees, vines, and shrubs or by the use of patios and trellises. This concept of shading to reduce smog level might also be applied to parking lots and recreation areas.

16266

Hudson, Gerald

AIR QUALITY SURVEY. EL PASO METROPOLITAN AREA. Texas State Dept. of Health, Austin, Div. of Occupational Health and Radiation Control, PHS Grants 69B-4701-SI and 69B-4707-RD, 160p., 1969. 12 refs.

An air sampling program was conducted from Oct. 17, 1968 to Nov. 17, 1968 to determine ambient air quality for the El Paso Metropolitan Area. The concentration and location of air pollutants present in the lower atmosphere were determined. The pollutants monitored were particulate matter, sulfur dioxide, hydrogen sulfide, carbon monoxide, total hydrocarbons, aldehydes, nitrogen dioxide, and ozone. Twenty five fixed sampling sites were chosen in representative locations throughout the area. There were numerous occurrences during the survey of periods of atmospheric stagnation which caused a buildup of pollutants. The period for the survey was deliberately chosen to coincide with the period of the year having the greatest frequency of atmospheric stagnation. A desire to obtain measurements of maximum air pollutant concentrations was a major factor in making this

choice. Concentrations of suspended particulates were greater than the ambient air standard of 200 micrograms/cu m 28% of the time. The sulfur dioxide ambient air standard was 0.2 ppm for 24 hr and 0.4 ppm for any 30 min period. Sulfur dioxide readings monitored during the survey were less than or equal to 0.15 ppm 97% of the time. Concentrations were greater than 1.0 ppm for 30-minute averages on two occasions. Concentrations of greater than 0.5 ppm for one hour were found less than 0.2% of the time. Carbon monoxide values ranged from 0 to 18 ppm, depending on traffic volume. The ambient air standard was not set. Standards for total hydrocarbons were not set either, but hourly averages ranged from 0-10 ppm. It was concluded that the El Paso area has an air pollution problem and the major pollutants are particulate matter, sulfur dioxide, carbon monoxide, and total hydrocarbons. Promotion of air pollution control and control methods were recommended, as well as legislation restricting emissions. Tables are given for industrial and metropolitan emission inventories, soiling index, steel plate corrosion, and particle size distribution. Climatology, topography, and meteorological parameters are discussed.

16274

Lagutin, Ye. I.

NEW DATA ON THE CHEMICAL COMPOSITION OF ATMOSPHERIC PRECIPITATIONS IN NORTHERN TIEN SHAN. (Novyye dannyye o khimicheskom sostave atmosternykh osadkov severnogo Tyan'-Shanya). Text in Russian. Doklady Akad. Nauk SSSR, 173(6):1426-1429, 1967. 3 refs.

The value of measurements of the chemical composition of atmospheric precipitations to studies of the metamorphosis of ground water under the influence of many natural factors as well as of that of air in the vicinity of modern industrial cities is stressed. A Table of the chemical composition of 19 samples of snow and one of rain is given, collected on stated days at stated locations in the Northern Tien Shan region lying within the confines of the Kirghiz S.S.R. The concentrations of microcomponents in atmospheric precipitations were determined by subjecting their dry residues to spectral analysis. The composition of the samples is given in terms of milligrams per liter of HSiO3 and of the following ions: HCO3(-), SO4(2-), Cl(-), Ca(2+), Mg(2+), Na(+), and K(+), as well as in the form of a 'chemical composition formula'. The total ion concentration, in milligrams per liter, and the hydrogen ion concentration, expressed in terms of pH value, are also given. Six samples were collected on March 4, 1965 at 6 elevations above sea level between 1000 and 3500 meters in 500-meter steps on the northern slope of the Kirghiz range bordering the Chuysk basin in the south. Five samples were collected at two-week intervals between Sept. 1 and Oct. 30, 1957, on the eastern shore of the Issyk-Kol lake in the Kokbel creek valley of the Dzhergalan river basin.

16684

Chovin, P.

AIR POLLUTION STUDIES IN PARIS AND OUTLYING DISTRICTS IN 1967. 1. OPERATION 'CARBON MONOXIDE', 2. OPERATION 'GARAGES', 3. OPERATION 'MONTPARNASSE, RAILROAD STATION', 4. OPERATION 'LOOP OF THE SEINE'. (Etudes de pollution atmospherique a Paris et dans les departements peripheriques en 1967. 1 - Operation 'Monoxyde de Carbone', 2 - Operation 'Garages', 3 - Operation 'Gare Montparnasse', 4 - Operation 'Boucle de la Seine'). Text in French. Prefecture de Police, Paris (France), Lab. Central, Rept. 58,337/D-PA, 80p., June 1968. 10 refs.

Results are reported of field studies of CO-pollution of air due to exhaust gases from motor vehicles in 1) central Paris, France (operation 'Carbon Monoxide') and 2) at air inlets and outlets of three underground parking garages (operation 'Garages'); 3) of air pollution by a variety of pollutants in the motor taxi hall of the new Montparnasse station in Paris (operation 'Gare Montparnasse'); as well as 4) of dust settling near the ground in the Seine river bend between Nanterre and Villeneuve-la-Garenne in the north-west part of the Departement de la Seine (operation 'Boucle de la Seine'). In 1), a total of 15,216 air samples were collected at 317 sites shown on the city map; 235 (1.54% of all) samples had a carbon monoxide content of more than 100 volume ppm at 129 of the sites. The average CO-concentration in the year 1967 was 25.9 volume ppm (a rising trend since 1960). In 2), in addition to the study of the effect of the presence of the garage ventilating system on the CO-concentration in its neighborhood, a search for the most representative locations of air sampling stations at different levels of an underground garage was undertaken. In 3), continuing a study begun in 1966, a laboratory van was stationed on July 29, 30, and 31, 1967 in the central part of the hall and the CO-, NO2- and NO-concentrations in air, and the Pb-content of dust collected in filtered were determined analytically and the concentration of benzo-3,4pyrene in this dust was determined fluorospectroscopically. As a result of a modification of the originally installed ventilating system of the hall made after the 1966 tests, air pollution had diminished. In 4), continuing a study begun in 1959, dust from air was collected on 30 cm diameter settling dishes, at 22 sites. The material collected by a dish during one month consisted of water, insoluble dust particles (cinders and benzo-3,4pyrene) as well as water soluble dusts (sulfates, chlorides, and calcium compounds). The amounts of these were determined and referred to an area of 100 sq m per month. The average monthly total amounts of dust collected at the 22 sites are shown. The results are evaluated statistically and are presented in the form of monthly averages and histograms. At one site the amounts of benzo-3,4pyrene were consistently exceptionally high; 7 new settling dishes installed at sites close to and surrounding a suspected source had four times higher amounts of benzo-3,4pyrene than any of the 21 other sites. This pinpointed a charcoal and asphalt processing plant as the most probable source.

16843

Stephens, Edgar R. and Frank R. Burleson

DISTRIBUTION OF LIGHT HYDROCARBONS IN AMBIENT AIR. J. Air Pollution Control Assoc., 19(12):929-936, Dec. 1969. 10 refs.

The diversity of hydrocarbons which are present in ambient polluted air provide a potentially rich source of information concerning the nature of this type of pollution. Measurements of the relative amounts of various hydrocarbons can be correlated with the various possible sources. Since hydrocarbon reactivities vary widely it is also possible to estimate the extent to which various individual hydrocarbons have reacted. Except for samples taken deliberately near sources of hydrocarbon pollution these air samples invariably resemble auto exhaust with an addition of natural gas and of C3-C5 paraffins which resemble gasoline vapor. Samples taken in industrial areas and near the smoke plume from a brush fire showed distinctive differences in composition. During the smog season in the fall of 1968 good data were obtained of "typical" or "representative" samples of light, medium and heavy smog. These show the expected depletion of more reactive hydrocarbons in a much more convincing way than before. By comparing these distributions with composition in unreacted samples and by making use of data from bottle irradiations, it was possible to estimate the contribution of the various hydrocarbons in terms of "amount reacted." The amounts of higher hydrocarbons present and reacted were also estimated from gasoline composition. (Author's Abstract)

16927

Kanitz, S.

POSSIBLE FORMATION OF 'PHOTOCHEMICAL SMOG' IN ITALY: SYNTHESIS AND DETERMINATION OF PEROXYACYLNITRATES IN THE LABORATORY AND IN THE OUTDOOR AIR OF GENOA. (Possibilita di formazione dello 'smog fotochimico' in Italia: sintesi e determinazione di perossiacilnitrati in laboratorio e nella atmosfera libera a Genova). Text in Italian. Giorn. Igiene Med. Prevent. (Genoa), 8(3):324-334, May-June 1967. 19 refs.

An experiment was conducted with gas chromotography to determine the possible presence of peroxyacetylnitrate (PAN) in the atmosphere above Genoa. The presence of this substance would indicate the existence of secondary air pollutants of the photochemical type, such as are found in Los Angeles smog. The PAN used as a standard was synthesized by photolysis from a mixture of ethyl nitrite and oxygen. Isolation of the PAN by gas chromotography took place in a Teflon column filled with 5% Carbowax 400. Samples of the atmosphere were taken on sunny days, with an absence of wind and a relative humidity below 40%, at the edge of a heavily traveled and highly congested highway. A second experiment checked the possibility of obtaining PAN by irradiating the exhaust of an 8-cycle motor of European manufacture and using high-test gasoline. Irradiation took place in a 2-liter pyrex

tube, using a mercury vapor UV lamp for periods of as much as 90 minutes. Experimental results revealed that the maximum level of PAN measured at Genoa is 0.33 ppb, which represents about 1/100 of the maximum to be found in such a location as Riverside, California. Analysis of the irradiated exhaust fumes also revealed the presence of PAN. Some of the chromatograms showed peaks that were strongly suspected of representing peroxypropylnitrate and peroxybutylnitrate, but this was not absolutely confirmed.

17068

Tokyo Inst. of Technology (Japan), Kiyoura Lab.

ABATEMENT OF AIR POLLUTION I - (1) SULPHUR DIOXIDE. (Ayusan haigasu ni yoru kogai bojo ho). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 1(1):55-58, April 15, 1965.

Sulfur- or sulfide-containing matter produces sulfurous acid gas when heated by air or oxygen. There is a danger of air pollution occurring if the density of sulfurous acid gas in air exceeds 0.3 ppm for long periods. Katz and his staff studied damage from sulfurous acid gas emitted by a zinc and lead refinery at Trail B. C. to woods in the basin of Columbia River. They found smoke pollution most prevalent in the spring. Smoke pollution occurs immediately if gas density is high. According to Zimmerman, the permissible limit of sulfurous acid gas is not 0.3 but 0.7 ppm. Holmes and his members experimentally determined that sulfuric acid mists from 30 to 65 ppm did little damage to alfalfa, sugar beets, etc., even after four hours. For four days in December, 1950, London was covered by a thick smog with a sulfurous acid gas content of 0.6 to 0.8 ppm; the death rate was nine times higher than usual. Sulfur dioxide is a colorless gas that is catalytically oxidized to sulfuric acid. Sulfuric acid is sharply reduced in water; sulfur dioxide melts in cold water.

17096

Selegean, Elena, M. Cucu, C. Anghelescu, I. Ardeleanu, C. Botezatu, M. Dargenta, A. Lucinescu, Olimpia Popa, Zamfira Stanescu, and N. Manea

INVESTIGATIONS ON THE OXIDIZING POTENTIAL OF THE AIR IN 4 TOWNS IN THE SOCIALIST REPUBLIC OF RUMANIA. (Cercetari cu privire la potentialul oxidant al aerului din 4 orase din Republica Socialista Romania). Text in Romanian. Igiena (Bucharest), 15(9):533-539, 1966. 16 refs.

The oxidizing potential of the air in 4 towns in Rumania was investigated over a period of 3 years. In 2 towns with large oil refineries, high O3 concentrations were found, particularly on sunny, summer days. This was probably due to the photochemical oxidation of the pollution emitted into the atmosphere. (Author summary modified)

17106

Endo, Ryosaku, Tetsutaro Kohgo, Tatsunori Oyake, Naoki Sugawara, and Toshiko Sakamoto

STUDIES ON THE URBAN ATMOSPHERIC POLLUTION BY AUTOMOTIVE EXHAUST GAS IN THE CITIES OF HOKKAIDO. (PART 2). ON THE INVESTIGATION IN OTARU CITY. (Hokkaido no toshi ni okeru jidosha haiki gasu no taiki osen ni tsuite (dai 2 ho) otarushi ni okeru chosa kekka ni tsuite). Text in Japanese. Hokkaido-ritsu Eisei Kenkyushoho, no. 18:143-149, June 1968. 11 refs.

The urban atmospheric pollution caused by automotive exhaust gas in Otaru was investigated. The measurement of dusts, carbon monoxide, sulfur dioxide, nitric oxide, nitrogen dioxide, lead, and 3,4-benzopyrene and the number of vehicles were carried out at 4 places along the roadside. The road at points A and B was narrow, at points C and D, it was wide. It was cloudy and calm at points A and B, and was clear and windy at points C and D. More vehicles passed by points A and B, with a maximum of 2000/hr at B. The concentration of all the pollutants were higher at point B with the exception of SO2. The maximum concentrations were listed. It was concluded that the atmosphere at the point B was more contaminated than points in the cities of Kushiro and Asahikawa which were previously investigated. (Author abstract modified)

17240

Odaira, Toshio

REVIEW ON AIR POLLUTANTS CONCENTRATIONS AND THEIR CORRELATIONS ON THE BASIS OF AIR POLLUTION PHENOMENA. (Osengensho karamita taikiosen shitsunodo to segokan no kankei). Text in Japanese. Taiki Osen Kenkyu (J Japan, Soc., Air Pollution), 3(3):167-178, Dec. 1, 1969. 3 refs.

Data on pollutant concentrations, atmospheric temperature at an elevation of 107 m, and wind direction and speed, obtained in Tokyo during August and December, 1967, were statistically analyzed. Although concentrations of various air pollutants can be determined in accordance with combinations of factors such as weather, topography, source intensity, etc, the effects of the latter were not analyzed concretely. Pollutants which showed similar pollution patterns (concentration frequencies) were grouped together. Four groups were found: particulates, carbon monoxide and nitric oxide, sulfur dioxide and nitrogen dioxide, and ozone. It was assumed that the pollution pattern varied from group to group. Particulate concentration was monitored by a digital dust meter, a tape light reflection index, and a tape light transmission index. Particulate concentration was twice as high in winter as in summer, and unaffected by wind direction. The CO concentration was three times as high in winter as in summer. A correlation was found between SO2 and NO2 concentrations and between CO and NO. The oxidant showed a concentration pattern different from the other three groups. It is concluded that it is possible to forecast air pollution by applying multiregressjon techniques or a simultaneous equation of two-step estimation to analyzers of sources, local weather, pressure distribution, etc.

K. LEGAL AND ADMINISTRATIVE

00169

A. J. Benline

1965 ANNUAL REPORT - DEPARTMENT OF AIR POLLUTION CONTROL - CITY OF NEW YORK. Dept. of Air Pollution Control News 8, (5) Apr. 1966. 40 pp.

LEGAL & ADMINISTRATIVE: Health impairment, New York City, Pollutants, Air Quality Measurement Programs, Control agencies

City of New York, Department of Air Pollution Control, Annual Report for 1965, describes New York City air pollution progress as it relates to administration and personnel; engineering; public opinion; types of pollution; means and methods to curtail air pollution.##

00206

CONTROL OF AIR POLLUTION ORIGINATING FROM FEDERAL INSTALLATIONS AND STANDARDS BY THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE IMPLEMENTING THE OBJECTIVES PRESCRIBED BY THE ORDER. EXECUTIVE ORDER 11282. Dept. of Health, Education, and Welfare, Washington, D.C. May 26, 1966. 6 pp.

The article specifies the overall policy, procedures for new federal facilities and buildings, and objectives for federal facilities and buildings insofar as air pollution control is concerned. In addition, standards to be used in this new order are delineated by Secretary Gardner. The categories to which the article alludes are: combustion of fuels, Stacks, Storage and handling of fuels and ash, and disposal of trash. In each instance are specified limits and means to measure the amount of pollutant covered by the above categories.##

00225

V.G. MacKenzie K. Flieger

THE CLEAN AIR ACT AMENDMENTS AND SOLID WASTE DISPOSAL ACT OF 1965 (P. L. 89-272). Health, Education, and Welfare Indicators. Nov. 1965. 15 pp.

The Clean Air Act Amendments and Solid Waste Disposal Act provide important new tools to help forge a comprehensive attack on the growing national problem of community air pollution. Under the Clean Air Act of 1963, the Department of Health, Education, and Welfare has undertaken the formation of a national program for the prevention and control of air pollution. The Amendments to the Clean Air Act and the Solid Waste Disposal Act will enable the Department to carry its efforts further in several of the most critical areas of the complex problem of air pollution.##

00359

McKee, J. E.

AIR POLLUTION CONTROL - ECONOMIC IMPACT OF GROWING PROBLEM. Trusts and Estates. Feb. 1964. 5 pp.

Author discusses the general parameters of air pollution and how it has changed over the years. Categories treated are : Magnitude of the Air Pollution Problem; Establishment of Local Agencies; Standards and Criteria; Motor Vehicle Control; Power Plants; Federal Government's Role in Pollution; and the General Extent and Nature of the Air Pollution Problem.##

CC897

M.P. Malbos

(THE STRUGGLE AGAINST AIR POLLUTION IN NEW YORK. REGULATIONS AND OBSERVATIONS ON THEIR APPLICATIONS.) La Lutte Contre La Pollution de l'Air a New York. Reglementation et Observations sur l'Application. Pollut Atmos. (Paris) 8(29):34-47, Jan.-Mar. 1966.

Two leaflets which were published and which concern the general methods to be used in New York's fight against air pollution are summarized. The first leaflet, published on October 1, 1964, gives the "New Code" for the control of air pollution, which includes the control methods, standards to be met for discharges, the rules for installing and maintaining machinery and appliances, and the standards of fuels to be used. The second leaflet, June 22, 1965, is the technical report of the Special Enquiry committee on Air Pollution, and gives the results of the measures put into effect against the different polluting agents in New York, the evaluation of discharges from different sources, and the role of the various municipal administrations set

up for the control and surveillance of the work. (Author summary)##

01211

J. A. Maga

AIR RESOURCE MANAGEMENT IN THE SAN FRANCISCO BAY AREA. (California State Dept. of Public Health, Bureau of Air Sanitation). California Univ., Berkeley, Inst. of Governmental Studies. 1965. 42 pp.

Author reviews the problems of air pollution in the San Francisco Bay Area, stressing the need for effective air quality standards. Topics covered in the report (all germane to the San Francisco Area) are: Air Pollution in the Metropolis; the concept of Air Resource Management; Weather, Topography and the Regional Air Resource; Air Pollution and its Effects; Air Pollution and its Relationship to other Regional Problems; a regional approach to the Control of Air Pollution; Control Programs in the Bay Area; and the outlook for the Bay Area.##

01567

H. Berge

EMISSICN CONTROL - A SUPRA-NATIONAL CONCERN IN OUR TECHNICAL AGE. (Immissionsschutz, Eine Uberstaatiche Gemeinschaftsaufgabe in Unseren Technischen Zeitalter.) Z. Sozialoekonomie, No. (614.7)1-8, 1966.

Local SO2 warnings; guide lines; and limit values are critically discussed with emphasis on the situation in Northern Rhine-Westphalia. The need for independent evaluations and supra-national regulations are stressed for the west European community. The economic and sociological as well as the biological aspects of the problem are discussed. The need for continuous measurements is underscored.##

01604

F.A. Venezia

THE INTERSTATE AIR POLLUTION STUDY: ST. LOUIS - EAST ST. LOUIS METROPOLITAN AREA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. (Presented at Missouri Public Health Association Convention, Kansas City, May 11, 1965.) 1965. 22 pp.

The Interstate Air Pollution Study of the St. Louis - East

St. Louis metropolitan area is described. The study was in keeping with the air resource management concept. Dustfall, suspended particulates, soiling index, sulfur dioxide, oxidants, odors, carbon monoxide, hydrocarbons, nitrogen oxide, nitrogen dioxide, sulfur dioxide, ozone, and visibility were measured. The effects indicated by steel corrosion, nylon and cotton deterioration, asthma, opinion surveys, and complaints were examined. An emission inventory, meteorology, fluorescent tracer diffusion, diffusion models, economic losses, legal aspects, and public relations were studied during the study.##

01853

A COMPILATION OF AMBIENT AIR QUALITY STANDARDS AND OBJECTIVES. Preprint. 1965.

Ambient air quality objectives describe a level of air quality designed to protect people from adverse effects of air pollution, and they are intended further to promote maximum comfort and enjoyment and use of property consistent with the economic and social well-being of the community. The Regional Ambient Air Quality Objectives of New York State Air Pollution Control Board are outlined and standards for ambient air quality and photochemical pollution adopted by the California State Board of Public Health are listed. Colorado's air pollution control act of 1964 and Oregon's State Sanitary Authority Administration Order are also given, as well as Regulations from San Francisco Bay Area Air Pollution Control District of May 1960, and from Florida. Exposure limits from West Germany and U.S.S.R. are also listed.##

02174

G. A. Jutze and E. C. Tabor.

THE CONTINUOUS AIR MONITORING PROGRAM. J. Air Pollution CONTROL ASSOC. 13, (6) 278-80, JUNE 1963. (PRESENTED AT THE 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

Authors discuss the Continuous Air Monitoring Program (CAMP) with particular emphasis on the sampling equipment it utilizes.##

02376

AIR RESOURCE MANAGEMENT PROGRAM SOUTHWESTERN OHIO-NORTHERN

KENTUCKY. Preprint. Published as report: Air Resource Management Program for Southwestern Ohio-Northern Kentucky, Mar. 1967, 51 pp. SWC - NK (Southwestern Ohio - Northern Kentucky) Air Pollution Survey, Cincinnati, Ohio, SWO - NK Technical Committee. 1966.

The primary purpose of this report is to assist the citizens and governments of southwestern Ohio and norther Kentucky in understanding the nature of their air pollution problem and in developing a course of action - an air resource management program - to assure desirable air quality both now and in the future. This report is the culmination of over a year of study and effort under the title, Southwestern Ohio - Northern Kentucky (SWC-NK) Air Pollution Survey. The survey, established by formal agreement on March 31, 1965, brought together governmental officials, interested citizens, and industrial leaders from both sides of the Ohio River to consider a problem common to them all and to propose a solution, of necessity, common to them all. This report also presents a general discussion of the air pollution problem and applies to it the ideal methodology for solving the problem, the air resource management concept. Various aspects of the air pollution problem in the project area are summarized from Technical Committee reports to provide background for the program proposal. The current status of control is also covered.

03353

DIGEST OF MUNICIPAL AIR POIIUTICN OFDINANCES. Pittsburgh Univ., Pa., Iaw Center. (PHS Publication No. 982.) 1962. 520 pp.

Regulations, ordinances and their administration regarding allowable concentration for air pollutants are presented. Enforcement procedures, inspection procedures, and penalties for violation of specific regulations are presented for urban areas. Air pollution control starts with the premise that no one has the right to use the atmosphere as a receptor of wastes in a manner which will adversely affect the health, comfort or property of others.##

03359

AIR POLLUTION IN NEW YORK CITY (INTERIM TECHNICAL REPT. M-970). New York City Council, Special Committee to Investigate Air Pollution. June 22, 1965. 74 pp.

Authors cover the following topics of air pollution as they relate to New York City: (1) air quality - a statistical analysis, (2) The effects of air pollution on health as well as agricultural

and plant life, (3) The major sources of air pollution in New York City, covering categories such as fuel combustion in stationary sources, vehicular exhaust, refuse combustion, industrial processes, and emission calculation, (4) The influence of weather, (5) and analysis of air pollution control program.##

03850

T. Martelli

(THE CONTRIBUTION OF LOCAL ADMINISTRATIONS IN THE FIGHT AGAINST ATMOSPHERIC POLLUTION. Il Contributo delle Amministrazioni Locali Alla Lotta Contra l'Inquinamenta Atmosferico. Fumi Polveri (Milan) 6, (9) 231-4, Sept. 1966. Text in It.

The local administrations should set forth the following directives: 1) Direct studies must be made to ascertain the local conditions that cause air pollution. These studies must also be made at successive time intervals. 2) Legislative decrees related to the problems of air pollution must be applied. The local regulations must be brought up to date. 3) Research and the application of favorable solution for urban centers and for the regulation of cehicular traffic must be undertaken. 4) Propaganda for the field of sanitary education must be initiated. A comparison between the causes of air pollution in various geographical districts of Italy are mentioned.##

04752

SMOG SIGNALS. Environ. Sci. Technol. 1 (1) 31-8, Jan. 1967.

The review is concerned with the growing interest in the pollution problem and evidences of a willingness on the part of the public to act. The interest in air pollution at various technical meetings and conferences held recently show that there is a change in the attitude of indifference. We are losing the fight against pollution because neither government nor industry has moved forward with the vigor and determination required. No one escapes the responsibility for contributing to air pollution. No one can escape the consequences of a polluted atmosphere and all will have to pay for the abatement. The motorist buying a 1968 car will pay a direct charge for air pollution control. The switch from high- to low-sulfur fuel in New York City will cost $12 million a year or $1.50 per capita. Based on an expenditure of $850 million per year for the installation and operation of equipment and disposal of collected pollutants, the cost would be only 0.14% of the gross national product. Land, air, and water resources must be exploited to support a constantly increasing population concentration while being expected to assimilate the steadily expanding spectrum of wastes being generated and released.##

05128

A. A. Roussel and H. Stephany

CONTINENTAL REPORT: EUROPE. Proc. Intern. Clean Air Cong., London, 1966, (Part I). (Paper II/6). pp 29-34 and J. Air Pollution Control Assoc. 16, (11) 583-6, Nov. 1966.

Air pollution by industry, domestic heating, and motor vehicles is a result of the local overburdening of the atmosphere which occurs in industrialized and densely populated countries. Areas of a questionable quality of air are chiefly localized in the congested areas of Middle Europe and progressive development of urbanization and industrialization currently increases the endangering of life and property by more and more densely spread emission sources. Neither the hygienic control of the atmosphere is sufficiently developed nor are the effects of complex air pollutions satisfactorily studied. A survey on European air pollution control legislation shows how far already the conclusions have been drawn from the reported facts. (Author abstract modified) ##

05571

F. N. Frenkiel

AIR POLLUTION IN THE GROWING COMMUNITY. Proc. Symp. Cleaner Air Urban Areas, Philadelphia, Pa. pp. 1-15 (1956).

Like any living being, a living community breathes. Its automobiles, railroads, home heaters, rubbish disposals, industry, power plants....all inhale air and exhale polluted air into the atmosphere. Here, Dr. Frenkiel discusses methods for studying the relative contributions of various pollution sources to a community's pollution problem, the increase of pollution in a growing community, and the effectiveness of certain methods for reducing pollution. He explains how a mathematical treatment can clarify the interplay among the many features of a community that contribute to its general air pollution problem - the location and density of pollution sources, meteorological conditions, community geography, and control measures. The main object of these mathematical studies, he points out, is to determine the probable patterns that pollution will take, and the contribution of each source to the pollutant concentration at any given location. He cites a study of this sort made using as an example of Los Angeles County. This mathematical treatment, or "model", then helps determine what measures must be taken when atmospheric pollution threatens to reach emergency levels, how effective various pollution control plans might be, what effect a new source might have on the pattern of concentration, forecasts of patterns that would result from contemplated urban expansion, and the effect of urban planning on predicated pollution levels.##

06124

Wiethaup, H

SMOG ALARM AND LEGISLATION. Der Smogalarm in Rechtlicher Sicht. (Zentr. Aerosol-Forsch. (Stuttgart)) 13, (5-6) 501-8, May 1967. Ger.

In the state of North Rhine Westphalia, Germany, there are presently in effect four legislative acts concerning air pollution. For incidents of severe smog conditions they provide for: compulsory change-over to fuels low in sulfur for industrial enterprises emitting more than 200 kg of sulfur dioxide per hour; banning motor traffic from certain areas; laws and regulations to administer and enforce the anti-air pollution acts. The author questions the necessity for these rather stringent laws since smog conditions in the area concerned are extremely rare; so far, smog has never been persistent or particularly obnoxious and is not known to have caused damage to human health, animal, or plant life. Caution and vigilance, however, are being exercised and cooperation of the industrial and private community is helpful.

06146

W. Rayher* and J. T. Middleton

THE CASE FOR CLEAN AIR (SPECIAL REPORT). Mill Factory 80,(4) 41-56, Apr. 1967.

The introduction in the form of a series of questions put to Dr. Middleton is of special interest in indicating the forward thrust of the Federal government in air pollution control since he is the Director of the National Center for Air Pollution Control which has the responsibility for the administration of the Federal air pollution control laws and regulations. His answers indicate vigorous activity by the Federal authorities where local authorities fail to act. The major provisions of the proposed Air Quality Act of 1967 are outlined as well as the existing Federal authority under the Clean Air Act of 1963. With this background of increased Federal activity and especially with the issuance of emission standards, this definitive review continues with an outline of the various types of air pollutants, their sources, and the accepted methods of control. In the section covering what is being done by industry today, examples are given of the control measures in effect at a rubber processing plant, a cement plant, steel plant, and a foundry.##

C6188

Larsen, Ralph I.

DETERMINING REDUCED-EMISSION GOALS NEEDED TO ACHIEVE AIR QUALITY GOALS--A HYPOTHETICAL CASE. J. Air Pollution Control Assoc., 17(12):823-829, Dec. 1967. 37 refs. Presented at the Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 11-16, 1967.)

Air management steps involved in determining reduced-emission goals include determining the effects of various pollutant concentrations on man, animals, plants, and property; deciding which effects to prevent; selecting ambient air quality goals that will prevent these effects; measuring and evaluating pollutant concentrations from sources and in the ambient atmosphere; calculating overall source reductions needed to achieve selected ambient air quality goals; and finally, determining reduced-emission goals for the various source types. Examples are cited of the various decisions and actions involved in determining a set of reduced-emission goals for stationary and mobile combustion sources.

06349

AMBIENT AIR QUALITY OBJECTIVES - PART 500 (STATUTORY AUTHORITY: PUBLIC HEALTH LAW. 1271, 1276). New York State Air Pollution Control Board, Albany, Dec. 11, 1964, 11 pp.

Ambient air quality objectives are tabulated for various pollutants. The objectives vary according to subregions which are determined by land use. Included is a list of references for the sampling and analytical methods employed in the measurement of particulates, sulfur dioxide, hydrogen disulfide, fluorides, beryllium, oxidants, carbon monoxide, and sulfuric acid mist.##

C6734

COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF HEALTH, AIR POLLUTION COMMISSION, AMBIENT AIR QUALITY CRITERIA. 90th Congress "Air Pollution--1967, Part IV (Air Quality Act)" Senate Committee on Public Works, Washington, D.C., Subcommittee on Air and Water Pollution, May 15-18, 1967.) p. 2396-7.

Ambient air quality criteria are tabulated as set forth in section 5 (f) (8) of the Pennsylvania Air Pollution Control Act of January 8, 1960, P.L. 2119. These criteria were adopted on April 25, 1967 by the Air Pollution Commission. Included in the tabulation are: particulates, lead, beryllium, fluorides, sulfur dioxide, carbon monoxide, and others. References are provided for the sampling and analytical methods employed for each pollutant.##

06754

(EXCERPTS FROM THE ANNUAL REPORT FOR 1964 OF THE STATE INSTITUTE FOR THE PRESERVATION OF CLEAN AIR AND AGRICULTURAL LAND.) Aus dem Jahresbericht 1964 der Landesanstalt fur Immissions- und Bodennutzungsschutz. Reinhaltung der Luft im Land Nordrhein-Westfalen (3) 39-48, 1965. Ger.

A survey was made of the activities of an agency of the State of North Rhine-Westfalia concerned with air pollution problems. Air pollution control programs are described, in particular the first, second, and third program for measuring SO2 and dust concentrations. Instrumentation for measuring SO2, F, H2S, NO2, and NH3 is mentioned. Some practical results of reducing the emission in various industrial plants are presented, mostly of the metal and coal-using industries. Extensive experiments have been made to determine harmful effects of air pollutants on plants. A list of plants ordered according to their susceptibility is given.##

07072

M. E. McLouth and J. P. Terry

AIR POLLUTION CONTROL AT CAPE KENNEDY. ((Am. Ind. Hyg. Assoc. J.)) 26 (2), 172-6 (Apr. 1965). (Presented at the American Industrial Hygiene Conference, Philadelphia, Pa., Apr. 26-30, 1964.)

Larger missiles and the increased use of toxic propellants require effective planning and operations to prevent the development of major air pollution problems. At Cape Kennedy Air Force Station, large-scale air-borne sources are of an instantaneous rather than a continuous nature. Significant air contamination sources include missile exhaust, aborts, spills of volatile propellants, disposal of toxic materials, and normal industrial or transportation activities. Abatement techniques incorporating equipment design, operations support, and environmental studies are discussed. Special emphasis is given controls, test data, and problems associated with the Titan II missile program. (Authors" abstract)##

07483

Maher, G. R.

AIR POLLUTION REGULATION OF NONVEHICULAR, ORGANIC-SOLVENT EMISSIONS BY LOS ANGELES RULE 66. J. Am. Oil Chemists Soc. 44(8):340A, Aug. 1967. (Presented at the AOCS Short Course, East Lansing, Mich., Aug. 29-Sept. 1, 1966.)

In an effort to control sources emitting organic solvents into the atmosphere, the Air Pollution Control District of Los Angeles County, Calif., successfully secured passage of Rule 66 into law. Rule 66 specifically relates to the control of organic solvent emissions from stationary sources. The major contributor to the 550-ton daily emission of organic solvents was industrial, commercial, and residential painting. Organic solvent-containing products are to be controlled as follows. 1. A maximum of 5% by volume of olefinic or cycloolefinic organic solvents may be present. 2. A maximum of 8% by volume of aromatic organic solvents having eight or more carbon atmos may be used. 3. Ketone organic solvents having a branched chain structure, such as methyl iso-butyl ketone, are limited to a maximum of 20% by volume. 4. A maximum of 20% by volume of toluene may be used. 5. Ethylbenzene, an aromatic organic solvent with eight carbon atmos, was given a special status and allowed a maximum of 20% by volume. 6. Trichloroethylene is restricted to a maximum of 20% by volume.##

07519

Chass, Robert L., Michael Pratch, and Arthur A. Atkisson

THE AIR POLLUTION DISASTER--PREVENTION PROGRAM OF LOS ANGELES COUNTY. J. Air Pollution Control Assoc., 8(1):72-81, May 1958. (Presented at the 50th Annual Meeting, Air Pollution Control Assoc., St. Louis, Mo., June 2-6, 1957.)

The objectives of the L.A. disaster prevention program are as follows: (1) To identify the specific contaminants present in smog which are capable of inducing health disturbances. (2) To establish concentration standards for these contaminants which provide a safe margin in the event of adverse meteorological conditions which would tend to concentrate their dosage in the Los Angeles Basin and to prevent their rapid dispersion and evacuation from populated areas. (3) To establish means of measuring continuously the presence of these critical contaminants in the Los Angeles atmosphere. (4) To establish emergency methods which may be implemented in the event measured concentrations approach the standards established as potentially harmful to the public. The approach used to attain each of these objectives is described.##

07550

Philadelphia Dept. of Public Health, Pa.

AIR POLLUTION FROM FUEL COMBUSTION PROCESSES IN PHILADELPHIA. Preprint, 8p., Sept. 1966.

The combustion of fuels is the greatest single source of air pollutant emissions within a metropolitan area. As much as 80% of

the total weight of pollutants discharged to the atmosphere result from the burning of fuels for electrical power generation, for industrial and commercial heat and power, for domestic heating, and for vehicular power. The purpose of this report is to summarize the present status of the problem in Philadelphia and to recommend necessary regulations and other action required to deal with the problem.##

07597

Heller, A.

MAXIMUM PERMISSIBLE CONCENTRATIONS FOR AIR POLLUTION IN THE FEDERAL REPUBLIC OF GERMANY. Preprint, Federal Inst. of Hygiene for Water, Soil and Air, Berlin, Germany, 10p., 1963. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963, Paper No. WHO/AP/8.)

An advisory committee set up by the Federal Government gives expert advice on the proposals of the Clean Air Commission of the Association of German Engineers regarding permissible emissions as well as on the maximum concentrations of "immissions" - the MIK values - for various air pollutants. The task of the Verein Deutscher Ingenieure Commission is to set scientific and technical bases for appropriate air pollution control measures. The main task of the Commission is to draft recommendations for new technical regulations as a basis for the determination and control of air pollution, as follows: Minimum requirements regarding the concentration and precipitation of dusts and gases in the atmosphere, bases for calculating the distribution of dusts and gases and for determining the required height of chimneys, limits to the emission of dust and gas from sources of air pollution, and procedures for measuring dusts and gases. The provisions recommended for examining applications for licences to establish new plants or to alter existing plants are reviewed. Enforcement of these regulations will depend on the local situation, especially the existing pollution load. They will also depend on the extent to which further pollution could occur, without exceeding the tolerance limit or the MIK-value for the most sensitive among the reaction partners, whether human being, animal or plant, and on the technical processes of the industrial plant in question. In principle, all reasonable technical and economic possibilites for purifying waste gases should be exploited in equal fashin by similar industrial plants. Finally, industry should be prepared to bear more far-reaching demands regarding waste-gas removal, if a licence for a new industrial plant or for the extension of an existing plant is to be issued in an area already polluted. MIK-values have been set and are discussed for; sulfur dioxide, hydrogen sulfide, some nitrous gases and chlorine.##

07766

Missouri Air Conservation Commission, Jefferson City

AIR QUALITY STANDARDS AND AIR POLLUTION CONTROL REGULATIONS FOR THE ST. LOUIS METROPOLITAN AREA. Preprint, 46 p., Feb. 22, 1967.

Allowable maximum average concentrations for various periods of time are listed for major pollutants such as SO2 and suspended particulates. Among the topics covered in the 24 regulations are: Restriction of Emission of Particulate Matter from Industrial Processes; Open Burning Restrictions< Restriction of Emissions of Sulfur Dioxide from Use of Fuel; and Control of Odors from Processing of Animal Matter.

07877

Downing, George

A REPORT ON AIR POLLUTION AND AIR POLLUTION CONTROL IN CLEVELAND. Preprint, 1956 Union Commerce Building, Cleveland, Ohio, ((76)) p., Sept. 21, 1967. 44 refs.

The contents are: (1) a brief survey of the national air pollution crisis; (2) a survey of the air pollution crisis in Cleveland; (3) statistics on the Cleveland pollution problem and how they are obtained; (4) the major sources of air pollution in Cleveland, effectiveness of present measures for their control, recommendations for future control; and general observations. A report of the National Center for Air Pollution Control on Relative Severity of Air Pollution in the 65 standard metropolitan statistical areas, August, 1967; Table on air pollution in 302 U. S. Cities prepared by the Division of Air Pollution of the Public Health Service, 1966; and Little Hoover Commission Report on Division of Air Pollution Control of the City of Cleveland, January, 1967 are appended.

08194

Kalyuzhnyi, D. N., Y. I. Kostoveskii, S. A. Davydov, and M. B. Aksel'rod

EFFECTIVENESS OF SANITARY CLEARANCE ZONES BETWEEN INDUSTRIAL ENTERPRISES AND RESIDENTIAL QUARTERS. Gigiena i Sanit., No. 4:9-12, 1952. Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. j, p. 179-183, Aug. 1960.
CFSTI: T TT 60-21913

Results of atmospheric air studies in the vicinity of chemical and metallurgical plants demonstrated that dust, sulfur dioxide, hydrogen sulfide and nitric oxide were absorbed from polluted air by suitable types of plant life to a considerable degree. It is recommended that in creating intervening sanitary clearance zones provisions should be made for planting suitable trees and other types of plant life. AS##

08463

Ross, Laurence W.

SIZING UP ANTI-POLLUTION LEGISLATION. Chem. Eng., 74(15):191-196, July 17, 1967. 18 refs.

At instigation of Federal Government, states are working rapidly toward effective standards for regulating quality of water and air. Standards for water will depend primarily on authoritative technical opinion and will vary according to local conditions. Standards for air quality will come increasingly under direction of Federal Government and will tend to be more uniform from locality to locality. Air control, state laws and regulations, municipal laws and regulations and the pattern for the future are air pollution topics discussed. Other topics dealing with water pollution are discussed.##

08554

Dorn, Warren M.

RULE 66 - A PART OF TOTAL AIR POLLUTION CONTROL. S.A.E. (Soc. Automotive Engrs.), Preprint 670807, 2p., 1967. (Presented at the Aeronautic & Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

The part Rule 66 plays in total air pollution control in Los Angeles County is explained. Background material on the control of visible emissions, sulfur, hydrocarbons, and motor vehicle emissions is presented. Finally, the background and acceptance of Rule 66 is described. (Author's abstract)

08556

Lunche, Robert G.

COMPLYING WITH SOLVENT CONTROL LEGISLATION. S.A.E. (SOoc. Automotive Engrs.), Preprint 670810, 3p., 1967. (Presented at the Aeronautic & Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

Compliance with Los Angeles County solvent control legislation be achieved by treatment of the organic emissions resulting from solvent usage, converting to less photochemically reactive solvents, or changing the process. An engineering permit system and an enforcement inspection program ensure that control equipment to treat the effluent is designed for the required efficiency and operated in compliance with the law. (Author's abstract)

09137

Cyrankiewicz, J.

PERMISSIBLE CONCENTRATION OF AIR POLLUTION. Dziennik Ustaw (Warsaw), No. 42:403-404, Oct. 8, 1966. Translated from Polish. Joint Publications Research Service, Washington, D. C., R-9119-D, 3p., Jan. 30, 1968.

Maximum allowable concentrations of SO2, H2SO4, NOx, H2S, CO, gasoline, dust, and CS2 in "special protection areas" and "protected areas" in Poland are outlined. Special protection area includes areas of health resorts and health protection areas, national parks, and reservations of natural resources. Protected area includes other terrains of the land, with the exception of land occupied by manufacturing establishments or other sources of pollution and protective zone areas. Exceptions for a specified period can be granted in the following cases: 1) Difficulties involved in the installation of air purification facilities in the manufacturing establishments due to exceptionally high investment costs, lack of opportunities to find a producer of such equipment or appropriate technical methods. 2) Excessive agglomeration of manufacturing establishments in a given area, which causes air pollution in excess of the permissible concentration in spite of the utilization of appropriate purification facilities. 3) When it is necessary to build in a given area a new manufacturing establishment which will result in exceeding the permissible concentration of air pollution in spite of the fact that the most adequate equipment has been installed to reduce the pollution.##

09281

California Motor Vehicle Pollution Control Board, Los Angeles

SMOG: THE SILENT ENEMY. (FOURTH BIENNIAL REPORT FOR CALENDAR YEARS 1965-66.) 32p., Jan. 1967.

California has led the world in the fight for cleaner air. Nowhere are found such dynamic and aggressive programs, both on local and Statewide levels. Nowhere are there more dedicated men and women engaged in the effort. Admittedly, the automobile is a major factor in befouling our atmosphere. The ultimate solution to the motor vehicle pollution problem may lie in a completely redesigned automobile engine or in a new motive power source. The Board has thoroughly examined these possibilities, such as the turbine and battery-powered car, and is encouraged for the future, perhaps a decade hence. But, until that time, the State must proceed with its present plans to reduce auto-created pollution with workable control systems or engine modifications. Through sustained, persistent efforts by a determined Administration, State Legislature, and Board, the automobile industry has acknowledge and complied with California|s leadership. Today, emission control is a fundamental factor in automobile engineering. For the first time all the world|s engine designers are hard at work on the problem. Today, emission control is |built-in,| not |added on,| to every Detroit product. This represents a phenomenal advance in the space of six and a half years. It will continue to result in a better product for the California car purchaser. All new California automobiles now come equipped with both crankcase and exhaust

emission control systems. The Highway Patrol is making random roadside checks to make sure that motorists are complying with the law, and the Department of Motor Vehicles has co-operated in carrying out the necessary registration procedures for controlled vehicles. Stricter emission standards must be applied in 1970. Oxides of nitrogen control systems will be incorporated into existing controls, if they are in harmony with hydrocarbon and carbon monoxide controls. Evaporative losses must also be reduced, with a consequent economic saving to the motorist. The Board is actively seeking and hopes to find a simple portable measurement device for all emissions. This would simplify annual emission inspection for all vehicles. There is no doubt that as time passes emission reduction systems will improve rapidly. The art and science of emission control are still in their infancy, but moving ahead.

09285

H. Wolozin

FEDERAL FISCAL POLICY IN AIR POLLUTION CONTROL. (PREPARED DISCUSSION.) Preprint, Massachusetts Univ., Boston, Dept. of Economics, 4p., 1966 (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 12-14, 1966.)

Important questions to consider in determining policies on air pollution are how much is presently known about polluted air, how extensive are damages and whether the damages are progressive and irreversible. Policy recommendations would be different if time were not of the essence and damages were remediable. Measurement techniques are confined to direct effects of high levels of contamination. It is recommended that priority be given to research on measuring indirect and insidious effects of low level exposures of long duration. The air pollution problem poses the need for serious considerations of alternatives to influence management decisions. Research is required to determine if effective control will not ultimately demand basic modification of traditional government-industry relations. It is recommended that air pollution authorities be given the authority and resources to pay for air pollution filtering and control devices or bear the cost of modifying existing equipment. In return authorities would receive the right through public commissions to participate in corporate decisions affecting emission of pollutants.##

C9765

Minnesota State Board of Health, Minn.

A REPORT ON AIR POLLUTION IN MINNESOTA. MSBH-L-172, p. 1-27, July 31, 1966.

Air pollution is of increasing significance in the State and requires the attention of the State. The legal problems of authority, obligations and jurisdiction are complex and require careful deliberation for their resolution. Prolonged deliberation should not delay the establishment of a State control program. Existing State laws are sufficient for the initial establishment of a technical air pollution control program by the State Board of Health if adequate funds are made available.

10327

McKee, John W.

TRENDS IN THE CONTROL OF PHOTOCHEMICAL SMOG IN THE LOS ANGELES BASIN. J. Environ. Sci., 11(3):34-41, June 1968. 12 refs.

The general background of the smog problem is considered, together with the effect of various emission standards on the projected output of unburned hydrocarbons in the Los Angeles basin and the effect of car pools, simple traffic patterns, and a rapid transit district. Current and planned California emission standards are not likely to solve the photochemical smog problem in the Los Angeles basin until the late 1980's or early 1980's. Emission controls are a long-range solution, just as the development of unconventional power plants for automobiles is a long-range solution. Installation of control devices for crankcase blowby emission when used cars are transferred (through a dealer) is not an effective solution and should be abandoned. The traffic pattern has a very sensitive effect on the amount of unburned hydrocarbons released by motor vehicles. If the recommended 1980 emission standards are not established or not met and no significant changes are made in traffic pattern, the level and extent of air pollution will probably increase in Southern California. Car pools when employed with the current emission standards are the most immediately effective approach to a solution. Pools should be advocated on only those days when smog is potentially severe. Unobstructed freeway driving should be encouraged, and start-stop driving should be discouraged, particularly in the metropolitan core. If new traffic pattern surveys show that staggered work hours are useful, they could be instituted on potentially smoggy days. Many partial solutions, such as mass rapid transit, staggered work hours, and car pools, may begin to be noticeably effective in the middle 1980's if implemented simultaneously.##

10992

Okita, Toshiichi

CONCENTRATION OF SULFATE AND OTHER INORGANIC MATERIALS IN FOG AND CLOUD WATER AND IN AEROSOL. J. Meteorol. Soc. Japan, 46(2):120-126, April 1968.

Measurements were made of sulfate and other inorganic materials

in fog and cloud water in 1963. It was found that in cumulus clouds above Mt. Norikura, sulfate was in the form of ammonium sulfate and sulfuric acid. In upslope fog at Shiobara, and in stratus cloud which covered Mt. Tsukuba, sulfate was supposed to be combined with some metals in addition to ammonium ions. During the periods of September 1962 to February 1963, and of July to December 1966, separate samplings of large and giant particles were made in Tokyo by means of a high volume cascade impactor. It was found that the weight ratio of SO4--/SO2 was above 0.12 at relative humidity above 55%, wind velocity below 4 m/sec and visibility below 5 km. It seems that atmospheric humidity is an important factor for the atmospheric oxidation of SO2. The relationship of the amounts of sulfate and ammonium was studied. These studies indicate that various weather and environmental conditions affect the atmospheric oxidation of SO2. The atmospheric concentration of hydrogen ion contained in aerosol was usually below 3 x .01 ug/cu m except on October 26, 1966, when the atmospheric concentration of hydrogen in large particles was 1.7 to 7.5 ug/cu m heavy smog. (Author's abstract)##

11064

Schmidt, F. H.

METEOROLOGICAL ASPECTS OF ATMOSPHERIC POLLUTION AND ATMOSPHERIC CHEMISTRY. Atmos. Environ., 2(4):423-426, July 1968.

Discussions are made in this report on the following topics: network of stations for measuring background pollution; sampling techniques from the meteorological point of view; meteorological factors influencing the dispersion of atmospheric pollution; boundary layer observations; special pollutants; forecasting pollution problems.##

11074

Chass, R. L., Krenz, W. E., and Dickinson, J. E.

AN APPRAISAL OF RULE 66 OF THE LOS ANGELES COUNTY AIR POLLUTION CONTROL DISTRICT. Preprint, Los Angeles County Air Pollution Control District, 22p., 1968. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-46.)

Emissions of organic solvents to the atmosphere of Los Angeles County Air Pollution Control District (APCD) are currently estimated at 600 tons per day. In order to reduce these emissions Rule 66 was enacted on July 28, 1966, after more than a year of joint effort by industry and the APCD. The provisions of rules 66, 66.1, and 66.2 are explained as well as how their enforcement will affect industry and the entire community, and discusses the methods being utilized by industry to bring its various operations into compliance. (Authors' abstract, modified)

11090

Scofield, Francis

THE PAINT INDUSTRY APPROACH TC SCLVENT EMISSION CONTROL.
Preprint, Naticnal Paint, Varnish and Lacquer Assoc., 4p.,
1968.

The National Paint, Varnish, and Lacquer Association established a smog chamber for the use of the paint industry, to be devoted entirely to solvents used in coatings. The chamber is currently operating and meaningful data are being collected. The objectives include: the determination of smog-fcrming tendencies of solvents which had not been previously examined, and which are not currently controlled; the examination of solvents currently ccntrolled, as members of a class (such as branched-chain ketones) although nc tests had been run on the specific compound; Study of the products of baking ovens; and study of the smog-forming reaction, to relate structure to smog-forming tendency. Some policies, contributions, and positions of the associ:ation are alsc described.##

11408

Public Health Service, Arlingtcn, Va., National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE SAN FRANCISCO BAY AREA AIR QUALITY CONTROL REGION. 46p., Dec. 1968. 25 refs.

"Air quality control regions" are designated to provide a basis for the establishment of air quality standards and the implementation of air quality ccntrol programs. A study of the San Francisco Bay Area has been conducted. The Region boundaries proposed in this repcrt reflect consideration of available and pertinent data. Data presented are evaluatien of urban factors, (land use, population, transportation, governmental organizations) and engineering factors, (emission inventory and meteorological data).##

11421T

Eilers, H.

AIR POLLUTION. IV. ALERT AND ALARM REGULATIONS IN SOME FOREIGN CITIES. ((Waakzaamheids- en alarmstelsels in enkele buitenlandse steden.)) Translated from Dutch. Ingenieur, 80(10):G33-G38, March 8, 1968. 17 refs.

Air pollution alert and alarm regulations in Ingolstadt, and the

Urhr area, Germany, New York city, and Los Angeles County are discussed in detail, tabulated and compared. The differences in predominant types of pollution - eg photooxidation in Los Angeles, SO2, soot, etc. in New York, and SO2 in the Urhr area - are noted, with a detailed explanation of the complexities of Los Angeles smog and of the various alarm stages used. The possibility and desirability of introducing an alarm system in the Netherlands is discussed. With increased motorization, the chance for damage to horticultural districts is increasing, and an alarm system, resulting in the limitation of traffic under unfavorable conditions, may be required.##

11734

Maga, John A.

CONSIDERATIONS IN ESTABLISHING AMBIENT AIR QUALITY STANDARDS. J. Occupational Med., 10(8):408-413, Aug. 1968.

Some of the factors to be considered in the establishment of air quality standards by the U.S.P.(.S. or state and local governments are the purposes and uses of such standards, the degree of understanding regarding the effects of pollutants on the environment, and the existence of usable data on the concentration of contaminants in the ambient air. A distinction is drawn between air quality standards and air quality criteria on which they are based, as well as between air quality standards and emission standards which serve as the direct basis for control. It is pointed out that ambient air quality standards are generally much lower than threshold limit values for occupational exposure, and that careful attention must be paid to the relationship between effects of air pollutants and concentration. An air monitoring program is an essential part of any developmental work towards the establishment of air quality standards. Among the potential effects to be taken into consideration are those on human health, vegetation and livestock; irritation to the senses, and impairment of visibility; soiling, unpleasant odors and other esthetic effects. The experience of the State of California in the establishment of air quality standards is briefly reviewed, with emphasis on the three-level approach ("emergency", "serious", and "adverse" levels) and the "oxidant index".##

11810

Stalsey, Consuelo E.

A HISTORY OF SMOG CONTROL LEGISLATION. In: An Educational Experiment in Self-Direct Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 137-156, 1968. 27 refs.

The activity of California state and local governments with respect to abatement of smog in the Los Angeles area is reviewed. In 1953, the first year of state action, Assembly bills were passed authorizing the establishing of emission standards and air quality

standards. No direct control measures for vehicular exhaust were instituted during the 1950's, but important changes occurred. Los Angeles County abandoned the concept of local control in favor of the alternative goal of state control. In 1960, the State Motor Vehicle Pollution Control Board was created and assigned the responsibility of testing and certifying automobile emission control devices. The impact of this legislation was noticeable: major car corporations began installing crankcase devices on cars to be sold in California. Strong legislative interest like that demonstrated in 1960 did not recccur until 1963, when a bill was introduced which proposed a system for the installation and inspection of motor vehicle control devices. Subsequent amendments relating to cost and enforcement procedures seriously weakened the bill. The Pure Air Act of 1968 similarly sidestepped the issue of enforcement and lowered the cost ceiling on car exhaust devices, thereby reducing development prospects. If clean air is restored to the Los Angeles area, it may be as the result of other bills that give serious consideration to alternatives to the internal combustion engine.

11811

Roberts, Thomas R.

AN OVERVIEW OF THE POLITICS OF AIR POLLUTION CONTROL. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 157-168, 1968. 35 refs.

The failure of the California legislature to enact a stringent smog control bill is examined in terms of rural opposition, bureaucratic indifferences, and pressure groups representing the automobile industry. Also discussed is the lack of coordination between three departments with crucial control responsibilities: the California Air Resources Board, which is responsible for the certification of control devices and emission standards; the California Highway Patrol Department, which licenses and inspects the official installation-inspection stations for control devices; and the California Department of Public Health, which issues recommendations for air quality standards. These agencies, which adopt varying and sometimes contradictory regulations and policies, are unable to collaborate on imaginative alternative pollution policies. The development of a smog control policy is additionally hindered by the hostility between the Air Resource Board and the Los Angeles County Air Pollution Control District. As a solution to the smog problem, a massive public education campaign is proposed to inform the public of the economic, medical, psychological and aesthetic costs of air pollution. Motorists must be willing to maintain their smog control devices before and after inspection.

13366

Japan. Prime Minister's Office.

1969 WHITE PAPER ABOUT PUBLIC NUISANCES. (Kogai hakusho). Text in Japanese. (Prepared in collaboration with 11 ministries and agencies, Government of Japan, for submission to the Japanese Diet). Tokyo, Printing Bureau of the Ministry of Finance, 1969, 230p.

This report summarizes the status, monitoring techniques, and management, including laws, of air and water pollution, noise and vibration, and soil erosion in Japan in April 1969. Particulate air pollutants in Japan are of four types: falling dust, which contains large particles and includes soot from burning coal or muddy dust; sulfur oxides, which are becoming increasingly important because of the increasing use of petroleum in recent years; floating dust, which has very small particles and includes mainly molecules of metallic compounds from burning materials and carbohydrates; and engine exhaust gas containing CO, NO2, hydrocarbons, and aldehydes. The amount of falling and/or floating dust has been gradually decreasing with the decreasing use of coal, especially in large industrial cities. At the same time, sulfur oxides, especially SO2, have been gradually increasing and have the highest concentration (more than 1.5 mg SO3/100 sq cm/day) in Kawasaki, Yokohama, Nagoya, Tokyo, Osaka, Muroran, and Yokkaichi. Among the harmful effects of polluted air on the human body, the ill effects on the respiratory tract (especially on the lungs) are most important. Chronic bronchitis, bronchial asthma, pulmonary emphysema, pulmonary fibrosis, pulmonary cancer, and cor pulmonale are the main lung diseases induced by polluted air. 3, 4-Benzopyrene, which is a component of automobile exhaust gas, was experimentally proved to be carcinogenic. In May 1962, the law entitled 'Provisions on the emission of smoke' was established to control the ambient air system, and three large city groups (Tokyo-Yokohama, Osaka-Kobe, and Kitakyushu) were designated as air-polluted areas. Several cities, including Yokkaichi, were subsequently designated. This law was improved in May 1968, especially from the viewpoint of prevention. A law which sets limits for automobile exhaust-gas emissions has also been in force since September 1966. Air pollution is monitored in Japan at more than 170 points. In recent years, several techniques of preventing air pollution have been devised with varying success: use of activated carbon or activated manganese dioxide to reduce SO2 concentrations; quantitative and qualitative measurement of air pollution severity using a simulation model of a polluted area; modification of internal-combustion engines; and development of electric automobile engines.

15605

Berindan, Cornelia

INTER-RELATION BETWEEN AIR POLLUTION AND OPEN SPACES, AS A PRINCIPLE FOR THE PROTECTION OF INDUSTRIAL URBAN CENTRES. (Interrelation pollution atmospherique et espaces verts en tant que principe protecteur des villes industrielles). Text in French. Pollut. Atmos. (Paris), 11(43):143-153. July-Sept. 1969. 59 refs.

The use of vegetation for the protection of residential areas from air pollutants emitted by neighboring industrial plants is reviewed. A table listing the principal (smog and its constituents), secondary (aerosols and oxides) and other gaseous aerosol, or particulate pollutants is given. Pertinent research concerns the effect of polluted air on vegetation, and the effect of vegetation on atmospheric air, particularly on polluted air. A table of phytotoxic effects of industrially polluted air is provided with respect to 267 subspecies of plants, as rated in Romania, Poland, USSR, Germany, Holland, Bulgaria, Austria, and Sweden. The capacity of retaining airborne dust by 12 species of trees is also tabulated. The capacity of plants to retain pollutant gases is discussed. The aerodynamic effects of tree plantings and their role in dust retention and as wind deflectors are pointed out. Illustrations of the use of green belts for protection of residential areas from polluted air based on studies made in the United States, Holland, Czechoslovakia, and Rumania are given. General principles which govern the layout of protective zones of vegetation in industrial urban centers are provided.

16504

Brocke, W.

MEASURES ADOPTED IN WEST GERMANY FOR COMBATING THE EMISSION OF SO2 INTO THE ATMOSPHERE. (Misure per combattere l'immissione dell' SO2 nell'atmosfera adottate nella Germania Occidentale). Text in Italian. Riv. Combust., 22(7/8):397-401, July-Aug. 1969. (Presented at the 'Le grandi Centrali Termoelettriche e nucleari ed i problemi dell'inquinamento atmosferico, Tavola Rotonda, Rome, April 4, 1968.)

Sources of atmospheric sulfur dioxide pollution in West Germany are distributed as follows: thermoelectric plants, 35%; industrial installations, 47%; and domestic uses, 18%. In North Rhine-Westphalia, the SO2 level is measured every 14 days at 5000 check points, over an area of 5000 square kilometers. This province, which produces 50% of Germany's electricity, 80% of its iron and steel, and 50% of its chemicals, has a smog warning system based on 12 special measuring points. At 2.5 mg/cu m, a preliminary alert is given, while at 5 mg/cu m of SO2, the authorities are to inform industries to switch to low-sulfur fuels, and motor traffic is to be restricted from 6-10 a.m. and 4-8 p.m. This provincial government has spent more than 6 million DM (about 1.5 million dollars) on studying desulfurizing procedures. Experimental projects include: the Reinluft process; lime/dolomite absorption; 'airborne ash-lignite'; activated carbon; the Siemens process (using iron oxides); the Grillo process (using special metallic oxides); the Sulfacid process; and experiments with wet processes, with special attention to methods of regenerating the washing solution. Desulfurizing the fumes from an electric plant increases the cost of each kilowatt hour by an estimated 4-10%. Certain by-products of the desulfurizing process are much in demand. No danger exists of saturating the market with sulfuric acid, ammonium sulfate, gypsum, or calcium sulfite.

If all the sulfur dioxide produced by German thermoelectric plants were made into sulfuric acid, it would fill only 60% of current demands for the acid.

16736

Cleary, Graham J.

A STATUS REPORT: AIR POLLUTION CONTROL IN AUSTRALIA. J. Air Pollution Control Assoc., 19(7):490-496, July 1969. 13 refs.

All but one of the Australian States now have legislation to control air pollution. These are similar in broad principle and rely upon the system of prior approval and the use of emission limits. At the present time Victoria is the only state with legislation providing for the recycling of crankcase vent gases on motor cars. Methods being used to control pollution and future outlook and needs are discussed. At least 65 percent of the crude oil requirements should be met by indigenous low sulfur oil by 1975. This fact and the imminent supply of natural gas to the four major cities and to the centers of heavy industrial development should result in a marked reduction in sulfur dioxide concentrations. A major outstanding problem is the lack of air pollution considerations in planning at regional and local government levels. (Author's Abstract)

16799

Sparrow, Christopher J., A. W. Skam, and N. G. Thom

THE GROWTH AND WORK OF THE AUCKLAND AIR POLLUTION RESEARCH COMMITTEE. Clean Air (J. Clean Air Soc. Australia New Zealand), 3(1):3-12, March 1969. 23 refs.

Some of the important characteristics of the Auckland Urban Area are briefly described prior to a discussion of the formation and organization of the Auckland Air Pollution Research Committee. The work of the committee is described and a summary of the results which have been obtained from its air sampling network is presented. The committee has carried out a considerable amount of research into local meteorological conditions and results to date are commented on. (Author's Abstract)

17188

Hashimoto, Michio

STATUS OF AIR POLLUTION BY NOXIOUS AND OFFENSIVE GASES AND THEIR CONTROL PROGRAMMES. (Yugai gasu to niyoru osen no genjo to sono taisaku ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(7):441-444, Aug. 15, 1966.

A procedure for the adequate control of noxious gases, some of

which are not yet covered by legislation, is discussed. Though dust fall is decreasing as a consequence of regulatory control, noxious and offensive gases are increasing in many industrial areas. The Labor Standard Law of 1947 provides for the control of working environments in the interest of worker health, but is no longer consistent with the present state of industrial pollution which poses a hazard for persons living in the vicinity of plants. The 1948 law regulating agricultural chemicals is concerned only with preventing injuries to people and livestock caused by the unrestricted use of chemicals; it does not consider the contribution of the chemicals to air pollution. High pressure gas control, fire prevention, mining, and other laws are subject to the same criticism. What is characteristic of these control laws is that they do not specify total noxious gas emission nor the relationship between a gas and its effect. The Smoke Dust Control Law is intended to compensate for these shortcomings; it now deals with sulfurous gas, anhydrous sulfuric gas with hydrogen fluoride, hydrogen sulfide, selenium oxide, hydrogen chloride, nitrogen dioxide, sulfur dioxide, hydrogen cyanide, carbon disulfide, ammonia, phosgene, and silicon tetrafluoride. More offensive gases are to be covered by the law.

18024

ILLINOIS MOVES ALONG IN FIGHT FOR CLEAN AIR. LEGISLATIVE STUDY COMMITTEE RECOMMENDS AIR QUALITY STANDARDS. Environ. Sci. Technol., 3(4):319-320, April 1969.

The Joint Air Pollution Study Committee of the Illinois General Assembly, began work in 1967. They have issued a final report calling for the following courses of action: Establishment of a Department of Environmental Pollution Control; abolishment of the present nine man air pollution control board; appointment of a superintendent of air pollution control; and endorsement of nine recommendations for air quality standards.

L. STANDARDS AND CRITERIA

00157

Maga, John A. and John R. Kinosian

MOTOR VEHICLE EMISSION STANDARDS - PRESENT AND FUTURE. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, New York, Society of Automotive Engineers, Inc., 1966, p. 297-306. 10 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

In California, the State Dept. of Public Health has established motor vehicle emission standards for exhaust hydrocarbons, carbon monoxide and smoke; for fuel tank and carburetor evaporative losses; and for crankcase hydrocarbon emissions. The data on which the standards are based and the need for improved measurement procedures are discussed. At this time, exhaust emission standards for oxides of nitrogen and for odor are being considered as additional standards. Future standards may rate hydrocarbon emissions according to their smog potential. Another possible change that is discussed is to specify the quantity rather than the concentration of pollutants that may be emitted from the exhaust of motor vehicles.##

00411

K. Horn

(THE PROBLEM OF HYGIENICALLY PERMISSIBLE LIMITING CONCENTRATIONS OF AIR POLLUTION.) Zur Frage der Hygienisch zulassigen Grenzkonzentrationen fur Luftverunreinigungen. Angew. Meteorol. (Berlin) 5 (Special Issue) :39-43, 1965. Text in Ger.

The problem of determining permissible limits of air pollution is discussed. After listing four categories of pollution ranging from decreased visibility and injury to sight and smell to acute illness and possibly death, the aurthor states that pollution should be kept below the limits of the first category. He distinguishes between limits permissible in a factory area and in a residential area, the first being higher. Permissible limits for 40 chemicals established in 1963 for single occurrences and average 24 hour concentrations for East Germany are tabulated.##

01007

E. T. Blomquist

FEDERAL ACTIVITY IN DEVELOPING AIR QUALITY CRITERIA. J. Air Pollution Control Assoc. 16(10):530-1, Oct. 1966. (Presehted at the 59th Annual Meeting, Air Pollution Control

Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-91.)

Documentation of air quality criteria for the oxides of sulfur and photochemical oxidants is discussed. Physical and chemical properties, the sources of the pollutants and their concentrations in the atmosphere, methods of measurement, chemical reactions in the atmosphere, and associated effects on visibility, materials, vegetation, man and animals were the main objectives of the literature review studies and tabulations.##

01149

W. W. Stalker and C. B. Robinson

A METHOD FOR USING AIR POLLUTION MEASUREMENTS AND PUBLIC OPINION TO ESTABLISH AMBIENT AIR QUALITY STANDARDS . J. Air Pollution Control Assoc. 17, (3) 142-4, March 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper 66-95.)

A household emission and opinion survey was conducted in Jefferson County, Alabama, to provide information that could be correlated with air quality data. A 21-station air sampling network was operated for one year previous to the opinion survey. Public attitude toward air pollution as a general nuisance in metropolitan Birmingham can apparently be estimated from dustfall, and to some extent, from suspended particulate levels. Based on public opinion versus ambient air pollutant level correlations, and assuming that no more than one-third of the people should be adversely affected by air pollution, it was found that ambient particulate levels should not exceed 30 tons/sq. mi./mo. as dustfall nor 150 micro gs/cu. m as suspended particulate matter. When dustfall reaches 40 tons/sq. mi./mo. or suspended particulate matter reaches 230 micro gs/cu. m, 50% of the households say that air pollution has become a general nuisance. (Author summary)##

01400

J. A. Maga

CONSIDERATIONS IN SETTING STANDARDS FOR OXIDES OF NITROGEN. J. Air Pollution Control Assoc., 15(12):561-564, Dec. 1965.

Since 1959 the California Department of Public Health has held responsibility for setting standards for ambient air quality for motor vehicle emissions. The need for standards for oxides of nitrogen involves consideration both of direct effects and effects resulting from participation in photochemical smog reactions. This paper discusses the various effects of concern and describes

the department's program for establishing air quality standards which will become the basis for vehicle emission standards and serve as guides for control of other sources of oxides of nitrogen. (Author abstract)##

01955

J. R. Goldsmith

SOME IMPLICATIONS OF AMBIENT AIR QUALITY STANDARDS. Arch. Environ. Health 4, 151-67, Feb. 1962. (Based in part on a paper presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 13, 1961.)

Author discusses the parameters of the air quality standards in California, starting with the efforts in 1959 and updating the progress to 1962. Allowable concentrations of oxidants are given; a general discussion of health based on air quality studies is given and, the general policy of California air quality standards is reviewed.##

02418

AMBIENT AIR QUALITY OBJECTIVES - CLASSIFICATIONS SYSTEM. New York State Pollution Control Board, Albany 1964. 14 pp.

Article contains the adoptions of ambient air quality objectives for New York State.##

03007

CALIFORNIA STANDARDS FOR AMBIENT AIR QUALITY AND MOTOR VEHICLE EXHAUST (TECHNICAL REPT.) California State Dept. of Public Health, Berkeley. 1959. 129 pp.

The salient points in the table of contents are: I. The standards and their significance. II. Technical bases for standards for the quality of ambient air. III. The technical bases for motor vehicle exhaust standards. In establishing the standards, an attempt was made to determine what effects the various pollutants were known to have at various levels of concentration on human health and confort, on animals, and plants, and on visibility. The resulting air quality standards together with data concerning motor vehicle emissions and their reactions then became the bases for motor vehicle exhaust standards. The air standards do not establish a fine line below which is good air and above which is bad air. They indicate

the approximate point at which air under some circumstances may produce undesirable effects.##

C3583

CALIFORNIA STANDARDS FOR AMBIENT AIR AND MOTOR VEHICLE EXHAUST (TECHNICAL REPT.). California State Dept. of Public Health, Berkeley. 1959. 16 pp.

These standards are presented as a yardstick which may be applied in maintaining and improving air quality. A graded set of ambient air standards was established which recognized the relationship between the seriousness of the effect of the pollutant and the urgency of control. Three levels of air pollutants were defined: adverse, serious, and emergency. The standards of motor vehicle exhaust contaminants are: hydrocarbons-275 ppm by volume as measured by a hexane-sensitized nondispersive infrared analyzer; carbon monoxide-1.5% by volume measured by a nondispersive infrared analyzer. The exhausts are to be measured during an eleven-mode operating cycle.##

05037

B. G. Giel

DEVELOPMENT OF AIR QUALITY CRITERIA. Symp. Bio-Environmental Engineering, Texas, 1964. pp. 63-72.

There is an important distinction between air quality standards and air quality criteria. Air quality standards are defined as levels of atmospheric contamination by specific pollutants or conbinations of pollutants prohibited under laws or ordinances enforced by municipal or State governments or regional agencies established by them and empowered with regulatory authority. Federal criteria, as called for in the Clean Air Act of 1963, are seen as recommended levels of air contamination expressed in terms of the adverse effects they can be expected to produce on man his property, and his environment. Such criteria would be based on the best available scientific information and would serve to guide municipal, State, and regional control agencies in the adoption of air quality standards and source emission limitations. Recommended levels of air pollutants should never be in a range which could adversely affect any segment of the population. Air quality criteria will have to be developed in full recognition of the fact that certain individuals and groups are unusually susceptible to acute as well as chronic injury from certain air pollutants. Another consideration is based on the fact that animals and plants are, in some instances, more susceptible than human beings to specific pollutants. In developing criteria, consideration may need to be given to the protection of the most susceptible target, whether it be animal or plant life. Air quality criteria will have to be uniform for all regions of the country, regardless of their current pollution

levels. Standards and source emission limitations, mentioned earlier, may vary in accordance with local prevailing conditions, but the criteria of air quality must be concerned with the protection of health and welfare under any circumstances. It should be noted that air quality criteria will have to take into account various synergistic interference, and masking effects of combinations of pollutants in the atmosphere. Thus an acceptable level of SO2 when considered alone may be x parts per million, but when SO2 is present in conjunction with suspended particulate matter, only one tenth x parts per million may be acceptable.##

05293

Pennsylvania State Dept. of Health, Harrisburg, Air Pollution Commission. (Apr. 25, 1967). 5 pp.

AMBIENT AIR QUALITY CRITERIA.

In accordance with Section 5 (f) (8) of the Pennsylvania Air Pollution Control Act, the Act of January 8, 1960, P. L. 2119, on April 25, 1967 the Air Pollution Commission adopted the Ambient Air Quality Criteria, which will be used by the Commission in: 1. Evaluating the results of community air pollution studies conducted by the Department of Health. 2. Determining the need for air pollution control regulations in regions of the Commonwealth to achieve these objectives. 3. Developing rules and regulations in accordance with Section 5 (f) (2) of the Pennsylvania Air Pollution Control Act. The sampling and analytical procedures employed to measure ambient levels of contaminants are to be consistent with obtaining accurate results which are representative of the conditions being evaluated.##

05545

Jaffe, L. S.

HEW-PHS COMMUNITY AIR QUALITY CRITERIA (FOR PHOTOCHEMICAL OXIDANTS). Preprint. 1965

The community air quality criteria are based on technical and scientific considerations and concepts. The particular values in a set of criteria are based on recorded effects resulting from specific pollutant time-concentrations exposures on man, plants, animals and/or materials. These criteria are intended to serve as guides to communities, metropolitan areas, regions, states, and other geographic or political subdivisions in the development of their air quality standards. The complexities of society will require the making of many decisions which involve balancing of judgement between health and other social "benefits" to be derived from clean air and the "risks" of economic and sociological costs to achieve such benefits. The specific air quality standards developed by an area, no doubt, will reflect such considerations

through assessment and evaluation of the degree and severity of the detrimental effects the government of the area is willing to tolerate versus the social effects and economic costs of attainint that level of pollution (or clean air.) The Public Health Service recommends that Level I of the criteria be regarded as the minimum goal or objective in establishing the community air quality standards (in order to maintain the effectiveness of human resources and long range economic strength). Level I is a measure of "first effects" of the pollutant(s) which produce a transient, probably reversible biological effect on man, plants or animals, or socially significant visibility, whichever is evidenced first. It is the minimal known level of effect - the lowest level of a pollutant at which a physiological response or physical or other effect occurs; below these concentrations and exposure times no direct or indirect physiological sequelae have been effectively measured. This level does not carry the connotation that it represents desirable community air quality, but it provides a modest safety factor for personal health insofar as present knowledge has determined. Levels II ("Adverse"), III ("Serious"), and IV ("Emergency") are defined. ASM

06573

PERMISSIBLE CONCENTRATIONS OF NITROUS GASES. (Maximale Immissions-Konzentrationen (MIK) Nitrose Gase.) VDI National Conference on Air Pollution, Washington, D.C., De . 10-12, 1962.) (Dec. 1962). 13 pp. Ger. (Tr.)

The VDI Specifications for Permissible Immission Concentrations (PIC) concern the determination of limit values for given types of air pollution. For purposes of comparison, the PIC-values are always confronted by the permissible workplace concentrations (PWC-value) of the respective gas, aerosol, or dust, i.e.,the present limit value for the mean concentration of the substance in the respiratory air at the work-place per 8-hour shift. The information is outlined under the headings of: Occurrence of Nitrosylsulphuric Acid; Properties of Nitrous Gases; Effects of Nitrous Gases; and Exposure Limits.##

06885

Gol'dberg, M. S.

HYGIENIC CRITERIA OF AIR PURITY IN POPULATED AREAS (ACCORDING TO MATERIALS OF THE GENEVA SYMPOSIUM). ((O kriteriyakh gigienicheskoi otsenki chistoty atmosfernogo vozdukha naselennykh mest)) ((Po materialam Zhenevskogo simpoziuma)). Hyg. Sanit. (Gigiena i Sanit.), 30(1):90-98, Jan. 1965. Translated from Russian.
CFSTI: TT 66-51033

In recent years there has been a steady increase in hygienic research on air in populated areas. The need for planning of measures for the control of atmospheric pollution is becoming increasingly urgent. The necessity for an international discussion of this subject, which would be a starting point for all measures undertaken for the sanitary protection of urban air, led the World Health Organization to convene an interregional symposium in Geneva from the 6th to the 12th of August, 1963, which was devoted to criteria for the quality of atmospheric air and methods of its investigation. The discussion was centered on the maximum permissible concentrations of harmful substances in urban air. After a lively discussion, the symposium adopted Prof. V. A. Ryazanov's proposal to establish a unified scale of standards for the quality of air by merging together the Soviet and American standards. In this way, an international scale for the atmospheric pollution has been established for the first time. The symposium drew up recommendations on the trend in medical research on the effect of atmospheric pollution on the health of the population, and a further elaboration of criteria and standards of atmospheric air quality in populated areas. Participants at the symposium also noted the necessity for the further development of scientific research on the mechanism of development of fibrotic pulmonary reaction induced by atmospheric pollutants, and for studies of the reaction of the mucosa of the respiratory tract, ciliary activity, etc. The symposium pointed out the necessity for paying special attention to studies of new synthetic chemicals which contaminate the atmosphere when discharged by industrial enterprises or when used in the household, as in the case of disinfectants.##

07197

RECOMMENDATIONS FOR ALLOWABLE CONCENTRATION (1966.) Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 4(4):62-66, 1966. Text in Japanese.

A report is given by a committee of the Japanese Association of Industrial Health on "Allowable concentration". The values of allowable concentration are worked out for a healthy man working 8 hr per day doing moderate work. Proper consideration must be given to cases in which more than 8 hr of exposure take place, more than one pollutant is involved, or the concentration of pollutants increases suddenly during the work schedule. Included is a discussion on dust measurement. It is important to measure dusts having a Stokes radius of less than 5 microns, especially at a height of 1 to 1.5 m from the ground. The relation between the source of dust and the point of measurement is illustrated.##

07490

Suzuki, T.

ON THE PERMISSIBLE CONCENTRATION OF AIR POLLUTANTS IN SOME

CCUNTRIES.. Text in Japanese.. J. Jap. Petrol. Inst. Tokyo, 7(2):87-91 Feb. 1964.. 4 refs..

There are no "international" permissible values of air pollutant concentrations at present. The maximum allowable concentrations and their methods of determination differ between countries. Values obtained in the Soviet Union, Czechoslovakia, West Germany, and the United States are compared. The values of permissible concentration are very low in the Soviet Union, even seemingly impossible of realization. Permissible values for 32 substances are tabulated. In West Germany, the values are expressed by MIK (Maximale Imission Konzentration) recommended by the VDI (Verein Deutscher Ingenieure). According to definition, the "Imission" value is the concentration of the elements found undesirable for "normal air".. With MIK, only SO2, nitrogen oxides, H2S, and chlorine are regulated.. Consideration of exposure time is also given. Values obtained in Czechoslovakia are for 16 materials determined as was done in the Soviet Union.. As for the United States, present methods of establishing MAC (Maximum Allowable Concentration) are described. Values for SO2 determined in California are tabulated.##

C7604

Rossano, August T., Jr.

ANALYSIS AND COMPARISON OF AVAILABLE DATA ON AIR QUALITY CRITERIA IN MEMBER CCUNTRIES.. Preprint, Washington Univ., Seattle, Dept.. of Civil Engineering, 22p.., 1963. 12 refs. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963, Paper No. WHO/AP/11.)

Air quality standard-setting activities of Great Britain, West Germany, USSR, Czechoslovakia, and the United States are reviewed. In addition, an analysis and comparison is made of criteria and maximum allowable concentrations developed by these countries.. Other countries of western Europe with the exception of West Germany and Czechoslovakia have not adapted air quality standards. In general the control of air pollution in Europe relies heavily upon regulations prohibiting the discharge of pollutants which may endanger the public health, be detrimental to safety,, crops and public monuments or constitute a public nuisance. Air quality standards for six specific gases have been developed by the Western German Commission.. Czechoslovakia and Russia have established air quality standards for a large number of pollutants.. In general their valves are similar.. In the United States definite progress in developing air quality standards has been made in only 2 states, are similar.. In the United States definitive progress in developing air quality standards has been made in only two states, Oregon and California. The air quality standards in Oregon pertain only to suspended particulate matter. The most extensive development of air quality standards in the United States has occurred in California.. Direct comparisons between ambient air quality standards of the various countries are not feasible because

the objective and criteria are different and the selected time exposure period varies in each country. The USSR standards are based primarily on human sub-concious thresholds while those of California, and to a great extent West Germany, are based on human conscious thresholds. This wide difference in standards is due in part to differences in medical and public health philosophy as to what constitutes a threat to health and well-being.

07605

Middleton, John T.

AIR QUALITY CRITERIA ASSOCIATED WITH VISIBILITY REDUCTION, SOILAGE AND DAMAGE TO VEGETATION. Preprint, California Univ., Riverside, Air Pollution Research Center, 14p., 1963. (Presented and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963. Paper No. WHO/AP/15.)

Particulate loading of the atmosphere is primarily responsible for reduction in visibility. The amount of visibility reduction, in turn, is due to the nature of the particle. The criterion for visibility is perhaps best given in terms of visible distance at a specific relative humidity. Air quality criteria for soilage may be developed where specific contaminants have direct effects upon particular materials. Since in general the soilage of goods is a function of multiple actions, air quality criteria for soilage are difficult of description and perhaps of lessened general utility. Air quality criteria for visible effects of vegetation damage can be developed for those toxicants which have direct effects, such as sulfur dioxide, ethylene, nitrogen dioxide, peroxyacyl nitrates, and ozone. Air quality criteria for fluorides cannot now be determined because of the multiplicity of factors which control the rate of accumulation and the subsequent effect of fluoride upon plant tissues. Levels of fluoride responsible for damage to livestock can be established and a criterion based on this is feasible.

08420

Brodovicz, Bey A.

AIR QUALITY CRITERIA FOR PENNSYLVANIA. J. Air Pollution Control Assoc., 18(1):21-23, Jan. 1968. 4 refs.

In late 1965 the Pennsylvania Air Pollution Commission appointed a Council of Technical Advisors to develop air quality criteria. Recently this Council set forth its recommendations for ten pollutants. The philosophy of the Council is expressed. The major difficulties and rationale are mentioned. The recommendations are given and the potential use of the criteria is also explained. The establishment of firm guidelines of air quality is based solely on consideration of effects both on health and aesthetics. The criteria are broken

into two distinct groups; air basin average and single point measurement. The pollutants included: 1. Suspended particulates (total), 2. Settled particulates (total), 3. Lead (tentative), 4. Beryllium, 5. Sulfates (as H_2SO_4), 6. Sulfuric acid mist, 7. Fluorides (total soluble, as HF), 8. Sulfur dioxide, 10. Oxidants, 11. Hydrogen sulfide, and 12. Carbon monoxide.##

08679

Maga, John A. and J. R. Goldsmith

STANDARDS FOR AIR QUALITY IN CALIFORNIA. J. Air Pollution Control Assoc., 10(6):453-455, 467, Dec. 1960. 8 refs. (Presented at the 53rd Annual Meeting, Air Pollution Control Assoc., Cincinnati, Ohio, May 22-26, 1960.)

The 1959 State legislature required that the California State Department of Public Health adop and publish standards for the quality of the air of the State. The act also provides that the standards may be amended from time to time and that they shall be adopted after public hearings. Concentrations for four substances --ozone, oxides of nitrogen, sulfur dioxide and carbon monoxide-- were established in 1955 by the Los Angeles County Air Pollution Control District as part of an alert system. Following adoption of the State air quality standards, that District amended the carbon monoxide alert values to include a concentration and time of exposure. The procedures for the adoption of the standards are detailed. Three levels of air pollutants were thus selected as follows: 1. Adverse Level - Level at which there will be sensory irritation, damage to vegetation, reduction in visibility, or similar effects.2. Serious Level-Level at which there will be alteration of bodily function or which is likely to lead to chronic disease. 3. Emergency Level - Level at which it is likely that acute sickness or death in sensitive groups of persons will occur. The three levels were not merely different degrees of severity but each represents qualitatively different effects. The concentrations that were used represent that was considered to be the lowest values at which the defined effect could be experienced by sensitive receptors. The standards that were established by the Department are given. Standards were set only for substances on which it was felt there were sufficient data. In addition, a number of footnotes are included. Some of these footnotes cover substances for which actual standards in the near future. One of the considerations of the Legislature in requiring air quality standards was that they would be used to determine standards for motor vehicle exhaust emissions. The "oxidant index" and carbon monoxide levels in the air quality standards had a direct and important bearing on standards for motor vehicle exhaust emissions that were also developed by the Department.

09259

Katz, Morris

RECENT DEVELOPMENTS IN AMBIENT AIR QUALITY GUIDES IN RELATION TO CONTROL OF ATMOSPHERIC EFFLUENTS. Pulp Paper Mag. Can. (Gardenvale), 69(4):60-66, Feb. 16, 1968. 11 refs. (Presented at the 3rd Paper Industry Air Stream Improvement Conference, Vancouver, B.C., Oct. 23-26, 1967.)

Major sources of air pollutants are discussed, as well as the need for control of emissions using source emission standards and ambient air quality criteria. Criteria for air quality reflect the nature and magnitude of effects of air pollutants upon the atmospheric environment in general and on visibility, safety, health of man or animals, vegetation and property. These criteria state four levels of pollutant concentration and exposure periods according to the differing effects on the exposed population or receptors, rangin from no direct or indirect influence to symptoms that may be merely adverse, or serious, or of emergency proportions. Ambient air quality guides and standards adopted by several countries are tabulated for CO2, CL2, ethylene, HCl, H2S, oxides of nitrogen, ozone or oxidant, CS2, and SO2. Those of the State of California, State of New York, West Germany, Czechoslovakia, U.S.A., and the U.S.S.R., are reviewed. Air quality standards established in the U.S.S.R. are more stringent than those formulated in West Germany, the U.S.A. (California), and elsewhere. Maximum allowable concentrations for some atmospheric pollutants (industrial) in the U.S.S.R. are also tabulated, including As, CrO3, Pb, Mn, and soot. A brief summary is given of Canadian activities and the salient features of the Ontario Air Pollution Control Act. The existence of these standards implies that stricter measures will be enforced to control emission sources in the future.##

10485

Larsen, Ralph I.

A NEW MATHEMATICAL MODEL OF AIR POLLUTANT CONCENTRATION, AVERAGING TIME,AND FREQUENCY. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 24p., 1968. 13 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968. Paper 68147.)

Continuous air pollutant concentration data have been analyzed for carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, nitrogen oxides, oxidant, and sulfur dioxide in 6 United States cities for 3 years. These data have been used to develop a mathematical model to express pollutant concentration as a function of averaging time and frequency. The two essential features of the model are derived from data analyses indicating that (1) concentrations are approximately lognormally distributed for all pollutants in all cities for all averaging times and (2) median concentration is proportional to averaging time to an exponent. Applications of this model to problems involving pollutant effects, air quality criteria, and air quality standards are shown. Air quality standards should be based on the prevention of certain

combinations of concentrations and exposure durations that may cause various undesirable effects. It is also recommended that air qualit standards specify maximum concentrations that are not to be exceeded more often than a stated frequency, commensurate with the undesirabl effects to be avoided, the pollutant involved, and the averaging time. In comparing air quality in a community to the standard, the calculated expecte value based on real air quality data and the mode presented herein, would be used. (Author's summary)

11414T

K. Biersteker

FRESH AIR QUALITY STANDARDS. (Kwaliteitsnormen Buitenlucht.) Translated from Dutch. T. Scc. Geneesk., No. 46:166-176, 1968. 58 refs.

Fresh air quality standards in different nations are reviewed. Considerable differences exist because the hazards of air pollution are assessed differently. However, the differences in clean air specifications appear to disappear as the maximum permissible impurity concentrations become gradually lower. The Committee for Soil, Water and Air in Rotterdam developed standards which have no legal significance but help government and industry to establish clean air policies. These standards are tabulated for chlorine, hydrogen fluoride, carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, hydrogen sulfide and sulfuric acid--with comparable standards shown for West Germany, Russia, and the United States. The permissible SO2 concentration in California is higher than in Europe. This is due to the fact that SO2 plays a minor role in summer fog formation. In Europe, however, fog occurs in the winter and is accompanied by high SO2 and smoke concentrations. Another notable difference in air quality standards is that the Russians have unrealistically high standards for clean air while in Western Europe air is considered as a raw material which should be left in a reasonably good condition for the next consumer. Air quality directives, being used for the city of Rotterdam, and air pollution alarm systems used for Los Angeles and proposed for New York, are discussed.##

12029

COMMUNITY AIR QUALITY GUIDES. ALDEHYDES. Am. Ind. Hyg. Assoc. J., 29(5):505-512, Sept.-Oct. 1968. 53 ref.

The multi-disciplinary backgrounds and professional competencies within the American Industrial Hygiene Association have been utilized to the fullest in the preparation of a series of ambient air quality guides. These are intended to be concise, and therefore are offered as single compounds, recognizing that other factors such as potentiation, antagonism, or other effects associated with mixtures, will create special problems from place to place and from time to time, the effects of which must be

individually evaluated. These guides are based on present scientific knowledge; as new data become available, the recommended threshold values are subject to change. The literature relating to the subject matter of each of the ambient air quality guide series is constantly being reviewed, and when indicated, new guides are prepared. (Author's Abstract)##

12030

K. Biersteker

AIR QUALITY STANDARDS. Tijdsch. Soc. Geneesk., 45(5):166-175, (1968). Text in Dutch. 58 ref.

A review of ambient air quality standards is given. The values differ widely, partly due to differences in methodology, partly due to differences between oxidizing and reducing pollution. The values are gradually getting closer, however, as time so far has lowered them every time a new set of values has been published. Rotterdam used air quality guides for several pollutants. The values have no legal value but help to give industry and control agencies something to base their plans on. (Author's Abstract)##

13527

Thomas, Moyer D.

REACTIVITIES OF SMOG COMPONENTS ARE CENTRAL ISSUE IN SETTING CONTROL STANDARDS. Environ. Sci. Technol., 3(7):629-633, July 1969. (Presented at the 156th national ACS meeting, Atlantic City, N. J., 1969.)

Photochemical smog contains nitrogen oxides, ozone, ozonated olefins and other organic compounds. Nitrogen oxides react with organic compounds to form noxious gases which are injurious to vegetation and are strong eye irritants. Maximum concentrations of nitric oxide and nitrogen dioxide occur during peak traffic hours. Ozone is phytotoxic, causing upper surface necrosis, stippling, and mottling. Human respiratory functions are adversely affected by 0.3 to 0.5 ppm ozone. Peroxyacyl compounds are said to be 200 times more irritating than formaldehyde and it also affects plants. Some of the polynuclear hydrocarbons are carcinogenic. Concentrations of remedial measures are presented. Discussion by D. B. Wimmer: Unlike air pollutants which originate from imperfections in the combustion process, nitric oxide is a basic and necessary product of efficient power production in internal combustion engines. It is uncertain whether reducing nitric oxide concentrations would reduce photochemical smog. The benefits are rather nebulous and costs are very concrete. Reaction rates, in addition to emission levels, should be considered in formulating regulations. Discussion by A. P. Altshuller: Most nitrogen oxides present in automobile and stationary sources are in the form of nitric oxide, indicating that nitrogen dioxide is

due to photochemical oxidation. The bulk of experimental data indicates that all photochemical air pollutants except nitrogen dioxide are much reduced by hydrocarbon control. Cost vs benefits should be considered in establishing controls.

14475

Huenigen, Edmund and Wolfgang Prietsch

ON THE PROBLEM OF LIMITING EMISSION OF TOXICANTS BY MOTOR VEHICLES IN EUROPE. (Zum Problem der Begrenzung der Schadstoffemission bei Kraftfahrzeugen in Europa). Text in German. Motortech. Z. (Stuttgart), 30(7):256-259, July 1969. 24 refs.

Maximum allowable emission concentrations in exhaust from motor vehicles in Europe are presently being worked out by an organization of the United Nations, the European Economic Commission. It has been suggested that the MAC values be determined by the "European driving cycle exhaust gas test" (EFA). Maximum allowable concentrations in the atmosphere have been set by individual European countries. A table compares the values set by the German Democratic Republic, the German Federal Republic, and Russia and shows that the limits are far more stringent in the GFR. The toxicological importance of carbon monoxide, hydrocarbons, and nitrogen oxides in each country will form the basis for working out uniform European limits. Based on the MAC for CO and on the premise that the MAC values should correspond to the toxicological importance of the pollutants, the MAC ratio for CO, hydrocarbons, and nitrogen oxides is 1:1.9:0.1. As measurements show, at present only CO emissions need to be limited. The other toxicants will not be limited until more measurements have brought detailed information concerning the relationship between emissions and air pollution. Limitations of CO emissions during idling is urgently needed.

14634

Dmitriyev, M. T.

APPLIED ASPECTS OF THE RADIATION CHEMISTRY OF A NITROGEN-OXYGEN SYSTEM. (Prikladnyye voprosy radiatsionnoy khimii sistemy azotkislorod). Text in Russian. Zh. Prikl. Khim., 41(5):973-982, May 1968. 21 refs.

Relationships were derived for determining the number of ions formed per unit time and the steady-state concentration of ions and electrons for a known radiation dose in air. It was established that concentrations of ozone occurring in normal air are produced by 25-30 r doses, and 50-60 r imparts an ozone odor to the air. Doses of about 3000 r produce the odor of nitrogen oxides. Up to 250 r, the concentration of ozone and nitrogen oxides does not reach the maximum permissible value. Maximum permissible dose for drinking water was established at

6 Mr based on nitrate ion, or 1.2 Mr based on nitrite ion; 0.05-0.4 Mr is recommended for purification of tap water; 0.05-1.2 Mr for water under field conditions, and 1 Mr for spring water. The maximum permissible dose for ammonia is 0.4 Mr. Maximum permissible doses for foodstuffs are as follows: liquids-1.2 Mr, moist foods-11 Mr, frozen foods-15 Mr, dry concentrates-95 Mr.

14772

Weaver, Neill K.

ATMOSPHERIC CONTAMINANTS AND STANDARDS. STATUS REPORT. J. Occupational Med., 11(9):455-461, Sept. 1969. 23 refs.

The Federal Air Quality Act of 1967 furnishes the methodology for the abatement of air pollution. Its provisions include the designation of air quality control regions and the issuance of air quality criteria and control technology documents, which will be followed by the promulgation of ambient air standards and emission standards at regional, state, and local levels. The atmospheric pollutants of current major concern are sulfur oxides, particulates, nitrogen oxides, hydrocarbons, oxidants, carbon monoxide, fluorine, and lead. Their toxic and other deleterious effects, exhibited at various concentration-time exposures, can be related to levels reached by the individual contaminants in the air of cities. While such an evaluation does not allow for possible interactions between pollutants, it appears that sulfur dioxide, oxidants, and carbon monoxide may be harmful to human health when the agents are concentrated, as in focal areas of emission or during sustained meteorologic inversions. Gains to be achieved by controlling these and other contaminants during non-peak conditions are probably derived from aesthetic, economic, and welfare benefits rather than health. Abatement procedures should eliminate rises in pollutant levels beyond the average ranges generally present in urban ambient air. (Author summary modified)

15336

Feldstein, Milton

AIR POLLUTION: BAY AREA. Clin. Toxicol., 2(3):307-317, Sept. 1969.

A review of air pollution problems in the San Francisco area is followed by a discussion of emission standards established by the Bay Area Pollution Control District and the duties of the State Air Resources Board. Areawide pollution problems are the reduction in visibility caused primarily by submicron particulate matter and the photochemical smog, whose primary effects are eye irritation, plant damage, and visibility reduction that

is caused by photochemical reaction between nitrogen oxides and organic compounds. Emission of solid materials is controlled by two types of standards, one limiting the opacity of smoke to Ringelmann 2 and another permitting no more than 0.3 grains of solid material per cu ft of gas to be emitted from certain industrial operations and no more than 0.2 grains per cu ft from commercial incinerators. While sulfur oxide emissions are controlled by setting maximum stack emissions limits, industrial sources must also monitor ground-level concentrations. Other regulations limit the emission of photochemically reactive olefins and aromatic compounds from industrial sources. Control of automobile emissions is under the Air Resources Board, which is currently developing air quality standards for 11 air basins in California. State emission standards are given for the years 1966 to 1974, and the tons per day of pollutant emissions in the Bay Area are listed according to their sources.

16518

California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation

NEW AND REVISED MOTOR VEHICLE STANDARDS ADOPTED. Clean Air Quart., 8(4):1-27, Dec. 1964.

California's 1970 emission standards for motor vehicles reduce hydrocarbon exhaust levels from 275 to 180 ppm by volume and carbon monoxide exhaust levels from 1.5 to 1.0 percent by volume. The crankcase hydrocarbon standard is lowered from 0.15 to 1.10 percent of the supplied fuel. For the first time the following standards are included for fuel tank and carburetor hot soak emissions respectively: 6 g/day; and 2 g/day. Approximately 95% of hydrocarbon losses are now covered by emission standards. However, further improvements in the standard are anticipated. It is hoped that the hydrocarbon standards can be eventually stated in terms of the reactive compounds producing photochemical smog. Also under consideration is a standard for nitrogen oxides. As the result of a prolonged smog attack in September and October 1964, three Southern California cities experienced more than 20 'adverse' days when the total oxidant exceeded 0.15 for one hour or longer. Unless emissions of pollutants, particularly those from automobiles, are curbed, further severe smog episodes will occur. The State Motor Vehicle Pollution Control Board has given its approval to the Chrysler exhaust control system. Current studies of carbon dioxide contamination from engine compartments show CO concentrations in closed cars of 100 to 200 ppm. Although exposure to these levels for two hours or longer could adversely affect a commuter's carboxyhemoglobin level, the CO levels are not likely to be influenced by controlling hydrocarbon and carbon monoxide emissions with afterburners. Levels of oxidants, nitrogen oxides, carbon monoxide, and sulfur dioxides recorded by state monitoring stations are tabulated.

16820

Pitts, James N., Jr.

ENVIRONMENTAL APPRAISAL: OXIDANTS, HYDROCARBONS, AND OXIDES OF NITROGEN. J. Air Pollution Control Assoc., 19(9):658-669, Sept. 1969. 55 refs.

The relationship between criteria, standards, and control of air pollutants involve complex multidisciplinary interactions. Their overall impact on the public health and welfare is directly related to the confidence level held by members of government, industry, and universities in the validity of the data upon which these criteria are based. The Environmental Appraisal section of the preliminary draft of the Air Quality Criteria Document "Photochemical Oxidant" prepared by the State of California, Department of Public Health, is reviewed. In general, it is a thoughtful and extensive effort to present the current status of information concerning the physical and chemical aspects of photochemical oxidant. Suggestions as to how it might be extended, revised or updated are presented along with a brief discussion of two new research areas of possible interest, singlet molecular oxygen as a possible environmental oxidant and the photochemistry of mixed lead halides in the atmosphere. This article is followed with a discussion by Richard D. Cadle. (Author's Abstract)

M. BASIC SCIENCE AND TECHNOLOGY

00001

A. P. Altshuller and I. R. Cohen

ATMOSPHERIC PHOTOOXIDATION OF THE ETHYLENE-NITRIC OXIDE SYSTEM. Intern. J. Air Water Pollution, Vol. 8: 611-632, 1964.

Because ethylene is not only a phytotoxicant but also is reactive in the photochemical type of air pollution, a detailed study has been made of the photooxidation of ethylene-nitrogen oxide mixtures in air. The effects were determined of varying the concentrations of ethylene between 0.1 and 5 ppm and of nitric oxide between 0.2 and 10 ppm on the rate of ethylene consumption, the rate of nitrogen dioxide formation and on the yields of various products. The greater part of the ethylene consumed could be accounted for in the products as formaldehyde or carbon monoxide. It was not possible to obtaina nitrogen balance in this system, although a small amount of methyl nitrate was produced. Ethylene-nitrogen oxide mixtures react rapidly in static irradiations at reactant co5centrations below 0.5 ppm. For example, photooxidation of a mixture initially containing 0.2 ppm of ethylene and 0.2 ppm of nitric oxide resulted in a nitrogen dioxide peak in 30 min and half conversion of ethylene in about 80 min. At equal ratios of reactants, ethylene-nitric oxide mixtures actually are more reactive at lower concentrations of reactants. In order to explain the experimental results it appears that free radical chain reactions must be postulated. A discussion of various mechanistic reaction steps is given. (Author)##

00031

R. E. Rebbert and P. Ausloos

TRIPLET-STATE ENERGY TRANSFER FROM ACETONE TO ALIPHATIC ALDEHYDES IN THE GAS PHASE. J. Am. Chem. Soc., Vol. 86: 4803-4807, Nov. 20, 1964. (Contribution from the National Bureau of Standards, Washington, D.C.)

The effect of relatively small concentrations of aldehyde on the gas-phase photolysis of acetone has been investigated. It is shown that aldehydes quench the phosphorescence emitted by acetone at 3130 A. but do not affect its fluorescence. The relative quenching efficiency of 2-butenal, butyraldehyde, propionaldehyde, and acetaldehyde is 100:2.7:1.9:0.95. On the basis of the experimental observations, it is suggested that an acetone molecule

can transfer its triplet-state energy to form a triplet excited aldehyde molecule. It is shown that the electronically excited aldehyde molecule formed in such an energy-transfer procdss shows the same modes of decomposition as in the direct photolysis. The energy-transfer process does not occur in the presence of oxygen and decreases in probability with an increase in temperature. (Author)##

00034

J.J. Bufalini A.P. Altshuller

THE EFFECT OF TEMPERATURE ON PHOTOCHEMICAL SMOG REACTIONS.
Intern. J. Air Water Pollution, Vol 7:769-771, 1963.

Results of measurements made for the photo-oxidation of trans-2-butenenitric oxide in air and for 1,3,5-trimethylbenzene-nitric oxide in air are discussed. The initial concentrations of the reactants in the two systems were as follows: trans-2-butene, 10 ppm; nitric oxide, 4.2 ppm; 1,3,5-trimethylbenzene, 6 ppm; nitric oxide, 3 ppm. The conversion times for both systems decreased by approximately a factor of two and the rates increased by a factor of two when the temperature was increased from 20 to 40 degrees. The conversion time at the nitrogen dioxide maximum and the rate of half-conversion of nitric oxide to nitrogen dioxide are two independent measures of reactivity which give good agreement on a relative basis. Similarly which give good agreement on a relative basis. Similarly on a relative basis, good agreement is obtained on the times at which the hydrocarbon reaches half of its initial concentration and the normalized rates at these times in the reaction although they do represent somewhat different measures of reactivity. The results from these two systems should not be taken as indicating that temperature changes are independent of the nature of the hydrocarbon used as a reactant. The investigation showed that temperature difference of a few degrees can cause measurable changes in photo-oxidation rates.##

00053

R.J. Ayen Y.S. Ng

CATALYTIC REDUCTION OF NITRIC OXIDE BY CARBON MONOXIDE.
Intern. J. Air Water Pollution Vol. 10:1-13, Oct. 11, 1965

Rate data for the catalytic reduction of NO with CO were obtained using a flow reactor operated differentially at atmospheric pressure and at temperatures of 160, 200, 220 and 240 C. Nitric oxide and carbon monoxide partial pressures were varied from 0.005 to 0.05 atm using helium as a diluent to bring the total gas flow to 2000 cc/min. A dual site mechanism was postulated for the reaction in which the rate determining step was a surface reaction between adjacently adsorbed CO and

NO molecules. From the data, rate and adsorption constants were evaluated for the corresponding rate expression. This expression is of practical use in the design of a catalytic converter to remove oxides of nitrogen from automotive exhaust gases and other exhaust streams. (Author)##

00058

R.S. Tipson

REVIEW OF OXIDATION OF POLYCYCLIC, AROMATIC HYDROCARBONS. National Bureau of Standards, Washington, D.C., Division of Physical Chemistry. (NBS Rept. 8363.) (NBS with PHS support.) May 27, 1964. 89pp.

A survey has been made of the literature on the oxidation of polycyclic, aromatic hydrocarbons. Information has been assembled on (1) the oxidants effective in the oxidation of such hydrocarbons, (2) the relative reactivity of the hydrocarbons, (3) the conditions under which oxidation proceeds, (4) the chemical mechanisms involved when such oxidations occur, and (5) the products formed. (Author)##

00069

C. Orr, Jr., W.P. Hendrix, F.K. Hurd, W.J. Corbett

INTERACTION OF SUBMICRON SMOG PARTICLES AND VAPORS (FINAL REPT.). Georgia Inst. of Tech., Atlanta, Engineering Experiment Station. Dec 31, 1961. 94 pp.

The purpose of this investigation was to determine the physical effect of organic solvent vapors on aerosols having particle radii in the range of 0.01 to 0.1 micron. To accomplish this, an ion counter was employed to determine the particle size distribution of various aerosols both in the presence of pure gases and in the presence of gases containing foreign vapors. The size distributions were established as functions of vapor concentration. Systems consisting of aerosolized particulates (listed first) and a vapor (listed second) such as ammonium iodide and alcohol, camphor and alcohol, poly(methyl methacrylate) and methyl ethyl ketone increased in particulate size with an increase in vapor concentration below relative humidities of 100% while systems of stearic acid and turpentine, carbon and benzene, graphite and benzene, paraffin and hexane, and napthalene and gasoline showed no size change below the saturation point. Except for the systems of graphite and benzene and carbon and benzene, the particulates were soluble to a measurable extent in the liquid phase of the vapor with which they were paired. From the results of this investigation it may be concluded that: (1) Particulate aerosols that are soluble in volatile organic solvents incease in size with increase in solvent vapor concentrations. The extent of the size change may be predicted from theoretical

considerations. (2) In general, the gr%eater the solubility of the aeroscl material the lower will be the relative humidity at which significant growth will cccur. (3) For materials with a relatively low solubility (less than approximately 5% by weight) relative huzilities in excess of 100% are required for growth if the nuclei size is cf the crder of 0.01 micron diameter. (4) An ion counter affords an excellent means for analyzing aerosol particulate radii in the range from 0.01 to 0.1 micron.##

00101

E. P. Koutsoukos and K. Nobe

CATALYTIC COMBUSTION OF HYDROCARBONS. IV. EFFECT OF PREPARATION METHOD ON CATALYTIC ACTIVITY. California Univ., Los Angeles, Dept. of Engineering. (Report No. 64-12.) Feb. 1964. 46 pp.
CFSTI: AD 601026

Five types of CuO catalysts were prepared in this study by varying the amount of KOH used in the precipitation of Cu(OH)2 from aqueous Cu(NO3)2 solutions. The rate of the catalytic combustion of ethylene was used as a measure of the activity of these catalysts. Overall rate expressicns of the form r equals kp sub E to the Nth power were used to correlate the experimental data. An average reaction order of 0.60 provided the best correlation of all the kinetic data. The experimental data indicated that the temperature required for a given conversion decreased with increasing amounts of KCH used in the preparation of the catalyst (up to 25% greater than stoichiometric). The BET surface area and mechanical strength of the catalyst increased with increasing KOH used. Using the specific rate constant per unti surface area as a measure of activity it was found that the catalytic activity of CuO decreased with increasing pH (or amount of KOH used). Comparison of the activity of the stcichiometric catalyst prepared in this investigation with the activity of cupric oxide-alumina (1:1) catalyst studied by Accomazzc for the same reacticn proved greatly in favor of pure CuO. (Author)##

00119

W. E. Wentworth, E. Chen, and J. E. Lovelock

THE PULSE-SAMPLING TECHNIQUE FOR THE STUDY OF ELECTRON-ATTACHMENT PHENOMENA. J. Phys. Chem. 70, (2) 445-58, Feb. 1966.

A study of the parameters characterizing the electron-capture detector operated in the pulse-sampling mode was carried out. The pulse width, approximately 0.4 microsec., applied voltage, -50v., and the pulse period approximately 1000 microsec., necessary to collect all of the electrons and to achieve a steady state when argon-10% methane is used as a carrier gas were determined. It was assumed that the electrons acquired a thermal distribution when no potential was applied to the cell and that the results were

independent of the pulse potential examined up to 80 v. A kinetic model of the processes occurring within the electron-capture detector operated in the pulse-sampling mode has been proposed. For the case in which the electron-capturing species is capable of forming a stable negative ion (in contrast to dissociative electron capture), the system of differential equations was solved using the steady-state approximation. From this solution, one can obtain the previously defined electron capture coefficient in terms of the constants for the processes proposed in the model. In certain cases one can obtain values for the rate constants and/or the electron affinity of the molecule from the temperature dependence of this electron-capture coefficient. Evidence is given for the validity of the proposed model, and the magnitude of the rate constants and the electron affinities are given for several aromatic hydrocarbons. (Author)##

00128

K. W. Egger and S. W. Benson

NITRIC OXIDE AND IODINE CATALYZED ISOMERIZATION OF OLEFINS. VI. THERMODYNAMIC DATA FROM EQUILIBRIUM STUDIES OF THE GEOMETRICAL AND POSITIONAL ISOMERIZATION OF N-PENTENES. J. Am. Chem. Soc. 88, 236-40, Jan. 20, 1966.

The equilibrium of the iodine catalyzed gas phase isomerization of 1-pentene and 2-pentene was studied over a temperature range from 114.5 to 335.3 degrees. The measured values for constants of both the positional and the geometrical isomerizations yield straight lines when plotted vs. 1/T(degree K). Entropy and enthalpy values were derived by application of least-square fits of data to linear equations using a standard computer regression program yield with standard errors (for a mean temperature of 500 K.) The data can be equally well fitted to both linear and quadratic equations. The data for the heats of isomerization are in very good agreement with values calculated from the data on the heat of formation reported by Prosen and Rossini and quoted in the API tables. The entropy differences between the isomers obtained from the direct experimental data agree reasonably well with the comparative estimates of Kilpatrick, et al. Values for partial group contributions and corrections thereof were calculated from the data of this work and results reported earlier from related studies on n-butenes and 1,3-pentadienes. They are in excellent agreement with earlier estimates.##

00161

C. A. Arrington, W. Brennen, G. P. Glass, J. V. Michael, and H. Niki

REACTIONS OF ATOMIC OXYGEN WITH ACETYLENE (I) KINETICS AND MECHANISMS. Harvard Univ., Cambridge, Mass., Dept. of Chemistry. Mar. 1965. 28 pp.
CFSTI: AD 464329

The room temperature reaction of acetylene with atomic oxygen has been studied in a moderately fast flow system. The course of the reaction was followed using both the Bendix T.O.F. Mass Spectrometer and a photometric method. The major products of the reaction were carbon monoxide and hydrogen. Large amounts of atomic hydrogen were also observed. The reaction scheme presented is consistent with the results obtained. The rate of the overall reaction is determined by the first initial step in which atomic oxygen adds to acetylene to yield an excited complex which then undergoes unimolecular decomposition to give triplet methylene. The rate constant for this initial reaction was measured, at room temperature as (8.9 plus or minus 2.8)x10 to -14th power cc./molecules. sec. The activation energy was less than 1 kcal./mole. Experiments with acetylene-d2 have established the specific reactions which constitute the major pathway by which triplet methylene, produced in the first initial step is consumed. (Author abstract)##

00231

J.W. Newton

EVIDENCE FOR A FUNCTIONAL DISULPHIDE IN PHOTOPHOSPHORYLATION. Nature, 195(4839):349-351, July 28, 1962.

The investigation reported here was prompted by results of immunochemical studies on chromatophores of photosynthetic bacteria and by the finding that the photochemical apparatus of Rhodospirillum rubrum yielded serologically univalent fragments after disulphide scission. The presence of these cell particles of a repeating antigenic sub-structure with individual determinant groups spaced between each pair of disulphides was therefore indicated. Production of the univalent subunits of chromatophores can be brought about by treatment with sulphite, heavy metals under alkaline conditions, mercaptans, or sonic oscillation. Since the antigens under consideration are placed in the chromatophore during photosynthetic growth, and since the photophosphorylation system appears in the chromatophore under these conditions, the possibility of a functional involvement of these structural disulphides in photophosphorylation has been examined. (Author's abstract)##

00238

E.R. Stephens, F.B. Burleson, E.A. Cardiff

THE PRODUCTION OF PURE PEROXYACYL NITRATES. J. Air Pollution Control Assoc. 15, (3) 87-9, Mar. 1965. (Presented at Sixth Conference on Methods in Air Pollution Studies, California State Dept. of Public Health Berkeley, Jan. 6-7, 1964.)

Three different reaction systems have been used to prepare the first three members of the PAN homologous series Two of these involve photolysis by ultraviolet black light lamps and one is a

dark reaction. All are carried out in the gas phase: (1) Photolysis of dilute (100 ppm) mixtures of a symmetrical olefin (e.g., 2 butene) with either nitric oxide or nitrogen dioxide in dry oxygen or air. This was the original method and it most closely resembles the way in which these compounds are formed in polluted atmospheres. (2) Photolysis of dilute alkyl nitrite in oxygen. This is the preferred method for PAN and PPN. It was successful for the preparation of the four carbon homologue. (3) The dark reaction of the appropriate aldehyde with NO2 and O3 at low concentration in oxygen. This is the preferred method for the preparation of the four carbon homologue. The starting material is n-butyraldehyde. In all cases the same gas chromatographic procedure is used for purification. (Author)##

OC353

A. Padwa D. Crumrine

PHOTOLYTIC DESULPHURIZATION OF DIBENZOYLSTILBENE EPISULPHIDE. Chem. Commun. (21) 506-7, Nov. 10, 1965.

The photo-extrusion of sulphur from dibenzoylstilbene episulphide (I) by ultraviolet light filtered through Pyrex glass is described. Irradiation of trans-dibenzoylstilbene episulphide (I) with a Pyrex filter in benzene as solvent afforded a mixture of cis- and trans-dibenzoylstilbene (II and III) in high yield. The photolysis was followed by infrared spectroscopy and was essentially complete in 30-60 min. The photodesulphurization is markedly stereospecific. Consideration of the isomeric distribution of the olefin obtained in a number of photolyses and the irradiation time demonstrated at least 90% stereoselective removal of sulphur from (I) to give (III). Increasing the time of the irradiation gave a slightly higher proportion of the cis-olefin but resulted in a diminished overall yield of the olefinic material. The lower yields can be attributed to a competing side reaction which predominates at longer photolysis time. The loss of sulphur from the episulphide upon photolysis is most simply explained by assuming a cleavage of the C alpha-S bond of the three-membered ring followed by loss of atomic sulphur. The light absorbed by (I) possesses sufficient energy to effect a carbon-sulphur bond vleavage.##

OC354

L. F. Phillips H. I. Schiff

MASS-SPECTROMETRIC STUDIES OF ATOMIC REACTIONS. V. THE REACTION OF NITROGEN ATOMS WITH NO2. J. Chem. Phys. 42, (9) 3171-4, May 1, 1965.

The reaction of N atoms with NO2 was studied in a fast flow system, using a mass spectrometer to monitor the

composition of the reaction mixutre. The rate constant for removal of NO2 by N was found to be 1.8 plus or minus 0.2 to the -11th power cc/mol/sec. By a combined mass-spectrometric and photometric method the relative contributions of the different primary reactions were determined as follows (errors shown are standard deviations): N plus NO2 YIELDS N2O plus O (0.43 plus or minus 0.04); N plus NO2 yields 2NO (0933 plus or minus 0907); N plus NO2 yields N2 plus O2 (0.10 plus or minus 0.12); N plus NO2 yields N2 plus 2O (0.13 plus or minus 0.11). (Author)##

00355

A. Padwa

PHOTOCHEMICAL TRANSFORMATIONS OF A BETA, GAMMA EPOXY KETONE.
J. Am. Chem. Soc. 87, 4205-7, 1965.

In contrast to exhaustive studies concerned with the photochemistry of alpha, beta epoxy ketones there has been no attempt, to date, to examine the phototransformations of the related beta, gamma acyl oxide system. Although a formally analogous rearrangement occurs, the mechanism of the transformation is markedly different.
trans-1,4-Diphenyl-3-buten-1-one one (I) was prepared by trans-1,4-diphenyl-2-butene-1,4-diol with p-toluenesulfonic acid. Treatment of I with m-chloroperbenzcic acid afforded, in essentially quantitative yield, trans-1,4-diphenyl-3,4-epoxy-butan-1-one (II). The irradiation of II was conducted using an internal water-cooled mercury arc lamp with a Pyrex filter to eliminate wave lengths below 280 millimicrons. The photolysis was followed by withdrawal of small samples at fixed intervals and examination of these by thin-layer chromatography. Upon irradiation of 500 mg. of II in benzene for 8 hr., the spot on a thin-layer plate due to II had completely disappeared and three new spots had appeared in its place. Chromatography of the crude photolysis mixture afforded 2,5-diphenylfuran (27%) and dibenzoylethane (III, 30%) as the only isoable products. The formation of 2,5-diphenylfuran was shown to be the result of a ground-state acid-catalyzed rearrangement of II. By using scanning liquid-liquid partition chromatography the crude photolysis mixture could be resolved into two major components. In addition to dibenzoylethane (III, 18%), an alcohol was obtained. The elemental analysis of this component IV indicates that it is an isomer of II. The molecular weight is consistent with a monomeric unit. The high-dulution IR spectrum (CHC13) of IV shows a sharp strong intramolecular hydrogen bond; the IR band corresponding to a non-bonded hydroxyl stretching frequency was absent. The fact that absorption due to this bond is strong and is invariant with concentration suggests that the hydroxyl group of IV is cis to the oxide ring. The ultraviolet spectrum (95% ethanol) with maxima IV is converted rapidly to dibenzoylethane by chromatography on Woelm base-washed alumina but can be recovered unchanged from liquid-liquid partition chromatography.##

00356

H. Kristinsson G. W. Griffin

PHOTOCYCLIZATION OF 3,3-DIMETHYL-1-PHENYLBUTENE-1. A NOVEL PHOTOINDUCED 1,2-METHYL MIGRATION. J. Am. Chem. Soc. 88, (2) 378-9, Jan. 20, 1966.

The first example of a photoinduced 1,2-methyl migration in a simple hydrocarbon system is reported. A mixture (1.3:1) of cis- and trans-3,3-dimethyl-1-phenylbutene-1 (Ia and Ib, respectively) was synthesized. A photoequilibrium between Ia and Ib was established rapidly under the irradiation conditions, and therefore separation was deemed unnecessary. Irradiation of I in benze (0.1 M) for 70 hr afforded almost exclusively 2,3-dimethyl-4-phenylbutene-1 (II). The primary products in this photoreaction are presumably cis- and trans-2,2,3-trimethyl-1-phenyl-cyclopropane (IVa and b, respectively). That IVa and IVb are intermediates in the conversion of I to II is supported by the observation that the isomeric cyclopropanes (IVa and IVb) are completely converted to the olefin II after only 24-hr irradiation in benzene (0.1). It is clear in view of this result why the cyclopropanes do not accumulate upon photolysis of I. It is assumed that the conversion of I to IV occurs in a concerted fashion with methyl migration accompanying cyclization. A mechanism involving formation of a common transitory intermediate which collapses to II directly or alternatively to IVa and IVb cannot be excluded, however, even though a pathway exists for facile conversion of IV to II.##

00357

H. E. Avery R. J. Cvetanovic

REACTION OF OXYGEN ATOMS WITH ACETALDEHYDE. J. Chem. Phys. 43, (10, Part I) 3727-33, Nov. 15, 1965.

The reaction of the ground-state triplet oxygen atoms with acetaldehyde at room temperature has been reinvestigated. Two different sources of ocygen atoms have been used: mercurcy photosensitized decomposition of nitrous oxide and photolysis of nitrogen dioxide at 3660 A. The results confirm the earlier conclusion from this Laboratory that the primary attack involves the abstraction of the aldehydic H atoms and not an insertion into the CH bonds of the aldehyde nor other primary steps suggested recently in the literature.##

00371

S. A. Clough F. X. Kneizys

OZONE ABSORPTION IN THE 9.0 MICRON REGION. Air Force Cambridge Research Labs., Bedford, Mass., Office of Aerospace Research. (Rept. No. AFCRL-65-862.) Nov. 1964. 83 pp.

The absorption of ozone in the 9.0 micron region of the infrared spectrum, due to transitions from the ground state to the v sub 1 and v sub 3 states, has been studied. This report gives the numerical results of an analysis of the spectrum including transition frrquencies and perturbed intensities ordered by quantur number and by frequency. Calculated and observed spectral controus are included. (Authors)##

OC417

E. DeBary, B. Braun, K. Bullrich

TABLES RELATED TO LIGHT SCATTERING IN A TURBID ATMOSPHERE (VOLUME 1). Office of Aerospace Research, Bedford, Mass., Air Force Cambridge Research Labs., Bedford, Mass., Office of Aerospace Research (Rept. Nc. AFCRL-65-710 (1) and Special Repts., No. 33.) pp. 1-351. Sept. 1965.
CFSTI,DDC: AD 628874

The tables present the results of computations of the intensity and the degree of polarization of sky radiation and radiation scattered by a unit volume of air containing natural aerosols. The tabulated data are based upon new values of the scattering functions i to the base 1 and i to the base 2 and the scattering cross sections derived using the Mie theory with m equal 1.5. In the case of primary scattering of radiation, the results are valid for a turbid atmosphere. The tables of the scattering coefficients and optical thickness, the absolute scattering functions, the intensities, and the degrees of polarization are computed for various wavelengths between 0.4 and 1.2 microns and for discrete scattering angles between 0 and 180 degrees. (Author abstract)##

00565

Story, Paul R. and John R. Burgess

OZONOLYSIS. EVIDENCE FOR CARBONYL OXIDE TAUTOMERIZATION AND FOR 1,3-DIPOLAR ADDITION TO OLEFINS. J. Am. Chem. Scc., 89(22):5726-5727, Oct. 25, 1967. 12 refs.

Evidence of the existence of carbonyl oxides is based on their reaction with alcohols to form alkoxy hydroperoxides. Studies report evidence for 1,3-dipolar addition of carbonyl oxides to aldehydes but none such for the similar addition to olefins. Evidence is presented for 1,3-dipolar addition of a carbonyl oxide to an olefin and further, that the olefin is a vinyl hydroperoxide, formed in the ozonolysis reaction by tautomerization of the carbonyl oxide. Upon examination of the reaction mixture from the ozonolysis of tetramethylethylene with gas and liquid chromatography, one of the major products was found to be peroxyhydroperoxide. A structural assignment was given to the compound on the basis of information obtained from the infrared absorption and nuclear magnetic resonance measurements along with

observation of various other reactions. It was also established that the other product obtained from the ozonolysis reaction was hydroxyacetone. The isolation of hydroxyacetone and peroxy hydroperoxide was thought to be good evidence for the tautomerization and subsequent rearrangement of carbonyl oxides. However, the structure assigned as peroxy hydroperoxide has now been found to be incorrect. Although the evidence for carbonyl oxide tautomerization stands, the evidence for carbonyl oxide addition to an olefin is not valid. The structures are presented along with newly found proof for elimination of the original one.##

00608

E. R. Allen, J. N. Pitts, Jr.

THE VAPOR PHASE REACTION OF METHYL RADICALS WITH CROTONALDEHYDE. J. Phys. Chem., 70(6):1691-1694, June 1966. 13 refs.

The reaction of crotonaldehyde (but-2-en-1-al) with methyl radicals (produced by the photolysis of acetone at 3130 A) at temperatures in the range 120 to 250 degrees has been investigated. The major products of the reaction were carbon monoxide, propylene, four isomeric butenes, methane, hydrogen, and ethane in decreasing order of abundance. The mechanism of the formation of products is discussed. An expression for the rate constant of the displacement reaction is presented.##

00612

E. Miescher

ANALYSIS OF THE SPECTRUM OF THE NITRIC OXIDE MOLECULE (ANNUAL SCIENTIFIC REPORT NO. 2). Basel Univ., (Switzerland), Dept. of Physics. (Rept. No. AFCRL-66-35.) Oct. 2, 1965. 16 pp.
CFSTI, DDC: AD 628 818

The absorption spectrum of the fourth isotope N15O18 was photographed with high resolution between 1770 and 1380 angstrom units. With medium resolution spectra of the four different isotopes N14O16, N15O16, N14O18, N15O18, have been obtained down to wavelenghts beyond 1300 angstrom units. New Rydberg-states ns, np, nd, nf... are reported. Data for a lower vibrational level of the I2 sigma plus non-Rydberg state are given. The former non-Rydberg state P2 pi is discussed and it is suggested to assign it as level v equal 4 of the I2 pi state. (Author abstract##

00663

S.E. Epstein

PHOTOACTIVATION OF POLYNUCLEAR HYDROCARBONS. Arch. Environ.

Health Vol. 10(2):233-239, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

This review presents some incomplete studies having three principal objectives: (1) to study photodynamic mechanisms as a parameter of activity of polynuclear carcinogens; (2) to determine the nature of the correlation existing between photodynamic and carcinogenic activities in the class of polynuclear compounds; and (3) to determine whether the degree of photodynamic activity of crude organic mixtures, such as air pollutants, could provide a useful and rapid biological measure of presumptive carcinogenic hazard to man, attributable to polynuclear compounds. Prior to separate consideration of these three objectives, the basic techniques used in these studies were briefly described.##

00700

I.C. Hisatsune

NITROGEN OXIDES - NECESSITY FOR A SYSTEMATIC APPROACH IN THEIR STUDIES. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-169.)

The nitrogen oxides, oxyacids, and ocyhalides, most of which are highly reactive and thermodynamically unstable, can be identified conveniently from their infrared absorption spectra. However, there are numerous ccincidences in the positions of the absorption bands of these molecules, and they have lead often to incorrect assignment of the spectra. Systematic studies of the vibrational spectra of these compounds have eliminated these difficulties, and characteristic spectra of many of them have been identified. Progress in these studies and in the use of the spectra data to determine thermodynamic properties are reviewed. (Author abstract)##

00916

E. J. Baum, J. K. S. Wan, and J. N. Pitts, Jr.

REACTIVITY OF EXCITED STATES. INTRAMOLECULAR HYDROGEN ATOM ABSTRACTION IN SUBSTITUTED BUTYRCPHENONES. J. Am. Chem. Soc., 88(12):2652-2659, June 20, 1966. (Presented in part at the Symposium on Structure and Photochemistry of Excited States, 149th National Meeting of the American Chemical Society, Detroit, Mich., Apr. 1964; and the IVth International Congress on Photobiolcgy, Oxford, England, July 1964.)

The quantum efficiency of photocycloelimination of ethylene ("type II process"), Phi sub II, frcm butyrophenone and

several para-substituted derivatives is highly sensitive to the electron-donating character of the substituent and to the nature of the lowest triplet state. Thus at 3130 A, 25 degrees, and in several solvents, Phi sub II drops from 0.42 and 0.39 in butyrophenone and p-methylbutyrophenone, respectively, to 0.00 in the p-NH2, p-OH, and p-C6H5 derivatives. Energy-transfer and spectroscopic studies indicate that the photoreaction proceeds from the lowest triplet state of these ketones and that this state is n, pi (asterisk) for reactive and Pi, Pi(asterisk) for unreactive ketones. p-Bromo- and o-hydroxybutyrophenone do not undergo photocycloelimination. The former eliminates bromine atoms with a quantum yield of 0.25. The latter photoenolizes in a reaction similar to that observed for o-hydroxy- and o-methylbenzophenone. The photocycloelimination reaction is temperature dependent with an activation energy of about 2 kcal/mole for butyrophenone. (Author abstract)##

00917

E. J. Baum and J. N. Pitts, Jr.

INTRAMOLECULAR ENERGY TRANSFER: PHOTOELIMINATION OF HALOGEN ATOMS FROM AROMATIC KETONES. J. Chem. Phys., Vol. 70:2066-2067, 1966.

Photochemical reaction of bromine atom photoelimination in p-bromobutyrophenone, a previously unreported reaction in ring-substituted aromatic ketones, is discussed. The results obtained indicated that photoelimination of halogen atoms was quite general for aromatic ketones substituted in the ring with Br and I.##

00923

J. N. Pitts, Jr., J. H. Sharp, and S. I. Chan

EFFECTS OF WAVELENGTH AND TEMPERATURE ON PRIMARY PROCESSES IN THE PHOTOLYSIS OF NITROGEN DIOXIDE AND A SPECTROSCOPIC-PHOTOCHEMICAL DETERMINATION OF THE DISSOCIATION ENERGY. J. Chem. Phys., 40(12):3655-3662, June 15, 1964.

The quantum yields of oxygen production in the photolysis of nitrogen dioxide have been determined at a series of wavelengths at room temperature and as a function of temperature at 3660, 4047, and 4358 A. These values were satisfactorily correlated with the extent of dissociation into NO and O atoms by means of O2 tracer techniques. On the basis of the above correlation and inert gas experiments, a general mechanism is proposed for the photolysis of NO2 from 3130 to 4047 A. Temperature effects are discussed in terms of a theoretical calculation based on the population of the rotational energy levels of NO2. This leads to a spectroscopic-photochemical determination of the dissociation energy of NO2 in good agreement with that calculated from thermodynamic data. (Author abstract)##

00925

J. K. S. Wan, R. N. McCormick, E. J. Baum, and J. N. Pitts, Jr.

THE ROLES OF MOLECULAR STRUCTURE AND ENVIRONMENT IN THE REACTIVITY OF EXCITED STATES. J. Am. Chem. Soc. 87(20):4409-4414, Oct. 20, 1965. (Presented at the Symposium on Structure and Photochemistry of Excited States, 149th National Meeting of the American Chemical Society, Detroit, Mich., Apr. 1965.)

The importance of molecular structure and environment in the reactivity of excited states was discussed and demonstrated by a study of two model photochemical systems in both conventional liquid medium and solid potassium bromide matrix. The two photochemical systems are the dimerization of anthracenes, which is a bimolecular reaction involving a Pi, Pi (asterisk) excited singlet and a ground-state monomer, and the cyclo-elimination process (type-II split) of butyrophenones, which is a unimolecular decomposition involving an n, pi(asterisk)triplet state. (Author abstract) ##

00939

J. J. Bufalini and E. R. Stephens

THE THERMAL OXIDATION OF NITRIC OXIDE IN THE PRESENCE OF ULTRAVIOLET LIGHT. Intern. J. Air Water Pollution, No. 9:123-128, 1965.

The kinetics of the thermal oxidation of nitric oxide in air have been studied in the parts per billion range under static and dynamic conditions. The results shown that the third order rate constant for the oxidation of nitric oxide with oxygen is (1.80 plus or minus/0.21) x 10 to the fourth power L square/mole square/sec. With the presence of ultraviolet light and nitrogen dioxide, the simple third order rate expression does not adequately describe the system. A mechanism is given that describes the system under these conditions. (Author abstract) ##

01026

Foote, J.K., M. H. Mallon, and J. N. Pitts, Jr.

THE VAPOR PHASE PHOTOLYSIS OF BENZENE AT 1849 A. J. Am. Chem. Soc., 88(16):3698-3702, Aug. 20, 1966. 28 refs.

The quantum yield of disappearance of benzene vapor at 1849 degrees is 0.9 plus or minus 0.3. The major irradiation product appears to be a valence isomer of benzene, tentatively identified as "benzvalene". Addition of diluent N2 reduces the rate of formation of the product but, up to 50mm total pressure, increases its maximum concentration. Small amounts of fragmentation

products, i.e. methane, ethane, ethylene, and acetylene, are also observed as well as considerable amounts of polymeric or carbonaceous deposit on the cell walls. These products may be formed in the secondary photolysis of "benzvalene". (Author abstract)##

01075

A. P. Altshuller and I. R. Cohen

ATMOSPHERIC REACTIONS OF PROPIONALDEHYDE IN AIR MIXTURES. Atmos. Environ. Vol. 1(3):319-25 (May 1967.)

A type of oxidant that has not been identified previously is present in atmospheric-type systems. It has not yet been shown whether ethyl hydroperoxide or other n-alkyl hydroperoxides are the phytotoxicants formed when aldehydes are photooxidized. These experimental results suggest that aldehyde reactions can become increasingly important if atmospheric concentrations of nitrogen oxide are reduced to low levels. (Author summary modified)##

01102

J. S. Arnold, R. J. Browne, E. A. Ogryzlo

THE RED EMISSION BANDS OF MOLECULAR OXYGEN. Photochem, Photobiol., Vol.4:963-969, 1965.
CFSTI,DDC: AD 631814

The temperature dependence and the absolute emission intensity of the 6340A band of molecular oxygen have been measured. The results indicate that the emitting pair of molecules is not bound and possesses a radiative half life of about 25 msec. The implications of these results on some chemiluminescent reactions are discussed. (Author abstract)##

01112

P. Varanasi and J. L. Lauer

A REDETERMINATION OF THE INTEGRATED INTENSITY OF THE 15 MICRON BANDS OF CARBON DIOXIDE . J. Quant. Spectro. Radiative Transfer, Vol.6:127-130, 1966.

The integrated intensity of the 15 micron bands of carbon dioxide at room temperature was determined by the self-broadening technique using gas pressures up to 10 atm. Great care was taken to eliminate stray light and to measure the geometric cell length at every pressure. A value of 200 plus or minus 10 cm to the -2 power atm to the -1 power was obtained. (Author abstract)##

01186

M. C. Wani and S. G. Levine

PHOTOCHEMISTRY OF 2-ALKYLAMINOPHENOXAZ-3-ONES. North Carolina State Univ., Raleigh, Dept. of Chemistry. 1965. 17 pp.
CFSTI,DDC: AD 631 366

As a continuation of 2 previous studies in photochemistry of 2-dialkylamino-phenoxaz-3-ones has been investigated. In general these compounds have been found to be more photo-reactive than the corresponding monoalkylamino-phenoxaz-3-ones. The-dimethylaminophenoxaz-3-one 4 underwent photochemical demethylation. Irradiation of the 2-polymethyleneiminophenoxaz-3-ones gave different products depending upon the size of the polymethyleneimine ring. The phenoxazones 9, 11, and 12 gave novel pentacyclic compounds 23, 25, and 26 respectively. Stable dihydrophenoxaz-3-ones have been obtained by the reduction of compounds 10, 11, and 12. (Author abstract)##

01210

J. N. Pitts, Jr., J. K. S. Wan, and E. A. Schuck

PHOTOCHEMICAL STUDIES IN AN ALKALI HALIDE MATRIX. I. An O-nitrobenzaldehyde Actinometer and Its Application to a Kinetic Study of the Photoreduction of Benzophenone by Benzhydrol in a Pressed Potassium Bromide Disk. J. Am. Chem. Soc. 86, 3606-10, Sept. 20, 1964.

The feasibility of quantitative photochemical studies in a solid KBr "pellet" of the type customarily used for IR studies was investigated. Irradiation was by filtered UV light at an angle to the "analyzing" IR beam from the IR spectrophotometer. An actinometer consisting of o-nitrobenzaldehyde dispersed in the KBr disk was developed to measure light intensities and was used to obtain room temperature quantum yields in the system benzophenone-benzhydrol similarly dispersed in KBr. IR spectroscopy was used to identify products and determine reaction rates by repetitive scanning in situ. In the photoreduction of benzophenone by benzhydrol at 3340 A., the value of phi for benzophenone disappearance was a function of benzhydrol concentration and approached unity at high concentrations. Benzhydrol disappeared by an apparent first-order law. Assuming a simple mechanism, the ratio of the rate constants for the deactivation vs. the reduction of excited benzophenone to form ketyl radicals was 0.0125 mole/l. of KBr. Addition of naphthalene to the "pellet" reduced the phi of benzophenone disappearance. The ratio of the rate constants k5/k3 for naphthalene "quenching" vs. reduction of benzophenone by benzhydrol was estimated at about 50. These experimental findings indicate that photoreduction in the KBr matrix proceeds via triplet benzophenone, as in liquid solutions. "Blending" benzophenone

and benzhydrol with KBr and forming disks at a pressure of 4800 p.s.i. by the usual pelletizing technique seems to result in a uniformly dispersed "solid solution." (Author abstract modified)##

01233

P. Ausloos and R. F. Rebbert

PHOTOELIMINATION OF ETHYLENE FROM 2-PENTANONE. J. Am. Chem. Soc. 86, pp. 4512, 1964.

Author reports additional information concerning photoelimination of olefins from carbonyl-containing compounds. Measurements of the light emission were observed in the energy transfer process in the photolysis of 2-pentanone. Authors conclude the probability that at any given wavelength the same process will occur from either a triplet or a single state may depend on the structure of the compound under consideration.##

01241

M. A. Accomazzo and K. Nobe

CATALYTIC COMBUSTION OF C1 TO C3 HYDROCARBONS. Ind. Eng. Chem. Prod. Res. Develop. 4, (4) 425-30, Oct. 1965. (Presented at the 149th Meeting American Chemical Society, Division of Petroleum Chemistry, Detroit, Mich., Apr. 1965.)

The catalytic combustion kinetics of methane, ethane, ethylene, acetylene, propane, propylene, propadiene, propyne, and cyclopropane on CuO:Al2O3 has been investigated at initial hydrocarbon concentrations between 182 and 1450 ppm in the temperature range 140 to 510 C., and at gas flow rates of 160, 275, and 525 liters per hour (NTP. The correlation considered temperature gradients along the bed and external diffusion of reactant to the catalyst surface. The predicted results agreed within 15% of the experimental results at the higher flow rates between 10 and 80% conversion. Methane was the most difficult hydrocarbon to oxidize and acetylene was the easiest. In general, increase in carbon number decreased the temperature necessary for a given conversion. For a given carbon number, the required temperature decreased with degree of saturation. The combustion products were essentially only carbon dioxide and water. The same catalyst bed was used for approximately 1000 hours with no loss in activity. (Author abstract)##

01318

H.J.R. Stevenson, D.E. Sanderson, A.P. Altshuller

FORMATION OF PHOTOCHEMICAL AEROSOLS. Intern. J. Air Water Pollution, Vol. 9:367-75, June 1965. (Presented at the American Industrial Association Conference, Philadelphia, Pa. April 29, 1964.)

Aerosol was produced photochemically by irradiation of a number of hydrocarbon-nitrogen dioxide mixtures, some requiring sulfur dioxide. In those reactions not requiring sulfur dioxide, its addition increased the aerosol production in most cases. Mixtures of hydrocarbons gave more aerosol than expected from their production individually. Shorter wavelength illumination had little effect indicating that sulfur dioxide activation is unimportant. The size of the aerosol depended upon the conditions of the experiment. (Author abstract) ##

01579

F.C. Alley L.A. Hipperton

THE EFFECT OF TEMPERATURE ON PHOTOCHEMICAL OXIDANT PRODUCTION IN A BENCH SCALE REACTION SYSTEM. J. Air Pollution Control Assoc., Vol. 11:581-584, Dec. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The tabulated results of nine irradiation runs are given for olefin and nitrogen dioxide mixtures. The oxidant production is shown as a function of time of irradiation and temperature. Oxidant production was calculated by subtracting the initial oxidant reading before the lights were turned on from the oxidant reading at the particular sample interval. The peak oxidant production was approximately doubled for each 10 degree temperature increase. The average hydrocarbon reaction rate for each four-hour irradiation period is plotted against temperature. The rate increased sharply as the reaction temperature increased from 13.5 to 25 C, then decreased slightly AS THE TEMPERATURE INCREASED TO 35.0 C. FROM THESE RESULTS IT is concluded that the peak oxidant production occurring during the irradiation of olefin and nitrogen dioxide mixtures is dependent on the reaction temperature. The magnitude of this temperature effect is of the same order as that which would be predicted for a thermal reaction. ##

01632

F. A. Vingiello and M. M. Schlechter

SYNTHESIS AND CYCLIZATION OF THE THREE ISOMERIC 2-BENZYLPHENYL PYRIDYL KETONES. J. Org. Chem. 28, 2448-50, Sept. 1963. (Presented before the Division of Organic Chemistry, Southeastern Regional Meeting, American Chemical Society, Richmond, Va., Nov. 1959.)

A considerable number of studies have been made regarding the rates of the acid-catalyzed aromatic cyclodehydration of ketones; these studies included only ketones containing one basic group, the carbonyl function of the ketone. Substituents on the ketone were restricted to alkyl groups and halogen atoms. The cyclization behavior of ketones containing a group more strongly

proton accepting than the ketonic carbonyl would test a possible limitation of the Bradsher-type aromatic cyclodehydration reaction. Protonation of the substituent might retard formation of the carbonium ion needed for cyclization. This inference actually does not exist since all three isomeric 2-benzylphenyl pyridyl ketones are cyclized at a faster rate than 2-benzylbenzophenone by the usual hydrobromic acid-acetic acid-water mixture.##

01648

W. E. Morganroth and J. G. Calvert

THE PHOTOLYSIS OF 1,1°-AZO-N-BUTANE VAPOR; THE REACTIONS OF THE N-BUTYL. Preprint. (Presented before the Division of Physical Chemistry, 149th National Meeting, American Chemical Society, Detroit, Mich., Sept. 1964.)

The vapor phase photolysis of 1,1°-azo-n-butane, at 3660 A was investigated as a function of reactant pressure, temperature, light intensity, and added gas. The sequence of listed reactions is consistent with observed results. With the assumption that the rate constant for the reaction, 2n-C4H9 yields n-C4H18 is 2.2 x 10 to the 13th power cc/mole-sec, and that for the reaction, (n-C4H9) 2N2 + M yields (n-C4H9)2N2 + M° is 3.2 x 10 to the 14th power cc/mole-sec, the rate constants for the following reactions were estimated: (n-C4H9)2N2 yields 2n-C4H9 plus N2, k2 approx equals 2.5 x 10 to the 9th power x e to the -3.8/RT power/sec; n-C4H9 yields C2H plus C2H5, k5 approx equals 3.7 x 10 to the 13th power x e to the -28.7/RT power/sec; n-C4H9 plus (n-C4H9) 2N2 yields n-C4H10 plus C4H8N2C4H9, k6 approx equals 1.4 x 10 to the 11th power x e to the -7.1/RT power cc/mole-sec. The disproportionation to the combination ratio for the n-C4H9 radical (k3/k4) is estimated as 0.14. Estimations of the thermodynamic quantities for the n-C4H9 radical are given.##

C1680

K.W. Egger S.W. Benson

IODINE AND NITRIC OXIDE CATALYZED ISOMERIZATION OF OLEFINS. VII. THE STABILIZATION ENERGY IN THE PENTADIENYL RADICAL AND THE KINETICS OF THE POSITIONAL ISOMERIZATION OF 1,4-PENTADIENE. J. Am. Chem. Soc. 88 (2) 241-6, Jan 20, 1966.

The kinetics of the iodine atom catalyzed isomerization of 1,4-pentadiene to form 1,3-pentadiene has been studied in the gas phase over a temperature range from 129 to 241. The formation of small amounts of n-pentenes and cyclopentene does not change the basically very simple rate law for the positional isomerization of n-pentadienes which is governed by the rate of abstraction of a hydrogen atom from 1,4-pentadiene by iodine. When compared with the activation energy for the analogous

hydrogen abstraction from n-pentane, assuming the activation energies for the back reactions to be equal (HI attack on pentyl and pentadienyl radicals), one obtains 15.4 plus or minus 1 kcal./mole for the resonance energy in the pentadienyl radical. This value is only 25% larger than the allyl stabilization energy. These stabilization energies are discussed in terms of a simple model of three-electron bonds and related to energies in the benzene system. (Author abstract modified) ##

01704

K. T. Whitby, B. Y. H. Liu, and C. M. Peterson

CHARGING AND DECAY OF MONODISPERSED AEROSOLS IN THE PRESENCE OF UNIPOLAR ION SOURCES. J. Colloid Sci. 20, (6) 585-601, Aug. 1965.

Results of experimental and theoretical studies were presented for the decay of aerosols in the presence of a continuous source of ions. The test aerosols used in the experimental studies were natural atmospheric contamination and generated aerosols. The generated aeroscls were solid, spherical, monodispersed, and initially electrically neutral. These aerosols were generated and tested in sizes varying from a mass median diameter of 0.028 to 3.6 microns having a geometrical standard deviation of 1.1 to 1.67. The aerosol decay experiments were conducted in a 2000 cubic foot rectangular room with a point source of unipolar ions located at the center of the room. Particle charge and concentration measurements were made and data were presented for three types of unipolar ion sources: a sonic-jet ion generator, a free-needle, and a commercial ionizer. Ions of both polarity were studied while the free ion current varied from 0.1 to 3.6 microamperes. The electrical charge measured on the particles was somewhat greater for the particles exposed to negative ions than for those exposed to positive ions. The charge measured on the particles with Dp less than 1 micron and exposed to an ion output of at least 2.7 microamperes showed good agreement with White's diffusion charging equation for Nt equal 10 to the 7th power. Charge on particles where Dp less than 1 micron was slightly less than that predicted by White's equation. The experimental half-lives of the decaying aerosols ranged from a minimum of 5.5 minutes for the free-needle and particle size of 0.26 micro mmd to a maximum of 58 minutes for a commercial ionizer and a particle size of 0.26 micron mmd. The performance of the sonic jet ionizer was intermediate between these two extremes. These results indicate that a continuous source of ions located in a space can precipitate a significant quantity of aerosol, and in some conditions it may be an effective means of air cleaning. The experimental half-lives of the decaying aerosols were compared with values predicted by theory. Generally good agreements between theory and data were obtained for the sonic jet ionizer. The differences between theory and data for the free-needle and the commercial ionizer were due to the fact that the experimental conditions did not approximate those assumed in the theory. ##

01747

J.C.W. Chien

THE PHOTOOXIDATION OF HYDROCARBONS. Hercules Chem. (53) 19-23, Sept. 1966.

After a brief discussion of photooxidation theory, photoinitiated oxidation in the presence and absence of light absorbers is described. The effect of impurities on photooxidation of hydrocarbons is discussed. The theory of charge-transfer absorption by hydrocarbon-oxygen systems is examined. Other charge-transfer initiated reactions are mentioned. It is concluded that charge-transfer is of little significance in the photooxidation of polyolefins. Governing factors for degradation of these resins are impurities and additives. Charge-transfer, however, may be responsible for photooxidation of hydrocarbons and sulfides in the atmosphere. The author believes that the hypothesis of photoinitiation by charge-transfer will lead to an extension of knowledge of reactions occurring in the atmosphere.##

01787

W.A. Guillory H.S. Johnston

INFRARED ABSORPTION BY PEROXY-NITROGEN TRIOXIDE FREE RADICAL IN THE GAS PHASE. J. Chem. Phys. 42, (7) 2457-61, Apr. 1, 1965.

In the course of studying the low-pressure thermal oxidation of nitric oxide by oxygen, a new absorption band occurring on the shoulder of the P branch of nitric oxide at 1840 cm was observed. The new absorption band was shown to be first order with respect to both nitric oxide and oxygen. The variation of this absorption band with time indicated that it was probably due to the free-radical intermediate present in this system, and was assigned to peroxy-nitrogen trioxide. The structural assignment OONO, rather than the symmetrical nitrate radical is based on the absorption frequency and by a comparison with frequencies expected for OONO and symmetrical NO3. By assuming a value for the absorption coefficient of OONO, which is presumably formed by the rapid reversible reaction O2 + NO equilibrium OONO, thermodynamic data concerning OONO and the equilibrium constant were estimated. (Author abstract)##

01801

A. Goetz

PARAMETERS FOR BIOCOLLOIDAL MATTER IN THE ATMOSPHERE. Proc. Atmos. Biol. Conf. 79-97, 1965.

Basic problems of tracing live matter in atmosphere hinge primarily on physical means available for converting this specific form of matter from highly dispersed airborne state into one of much greater compactness at the sensor device, as its ability to produce a signal depends necessarily upon amount of specific matter available to it. An equally basic condition is avoidance of viability interference by process of precipitation. Parameters guiding this effort can be derived from properties of aerocolloidal matter in general: of the particulates, to be considered more or less permanent atmospheric constituents, the upper size limit lies for the biosphere at kinetic (Stokes') diameters (between 5 and 8 microns), but decreases rapidly with altitude, whereas the lower limit for stable particulates of significant frequency appears to be at approximately 0.05 micron. This size range embraces, thus, about two decades and includes bacterial cells, spores, virus-like forms, but excludes from permanent suspension pollen, seeds, etc. Aerocolloidal matter in the average represents but 10 to the minus 7 power to 10 to the minus 8 power of suspending gas mass and amounts to a numerical concentration of 10 to the 6th power to 10 to the tenth power/cubic meter of which the biocolloidae components can be assumed to be only a minute fraction (equal to cr less than 10 to the minus 5 poweer fraction (equal to or less than 10 to the minus 5 power). While upper kinetic size limit is determined by high fallout rates, steeply declining frequency for smallest sizes is partly due to increase of chemical activity - and thus instability - caused by high surface curvatures (Kelvin relation), and partly due to their physical (Brownian) mobility which promotes coalescence. As most important for preservation of viability, interaction of the particulates with potentially reactive molecular traces in their gaseous environment is discussed, especially under photactivating conditions. A similar factor concerns viability interference by contact within close-packed sample precipitates and becomes of major significance whenever coexistent particulates are carriers of photochemical reaction products (such as aldehydes, ozonates, etc.) which are likely to produce toxic effects. Constitution of natural aerocolloids - particularly regarding their organo-soluble and thermally metastable components - is discussed and illustrated. (Author abstract)##

01833

P. Ausloos and S. G. Lias

H2-TRANSFER REACTIONS IN THE GAS-PHASE RADIOLYSIS OF HYDROCARBONS. J. Chem. Phys. 43, (1) 127-35, July 1, 1965.

The radiolysis of cyclohexane has been investigated in the presence of varying concentrations of acetylene, ethylene, propylene, butene, and cyclopropane. On the basis of a number of observations, it is concluded that, in all cases, the H2-transfer reaction C sub n H sub m plus cyclo-C6H12 plus yields C sub n H sub m plus 2 does take place. No extensive rearrangement occurs in the collision complex. For instance, a transfer of H2

to CD3CDCD2 results exclusively in the formation of CD3CDHCD2H, while an H2 transfer to (CD2)3 leads to the formation of CD2HCD2CD2H. Relative rate constants for the transfer of an H2 molecule to CH3CHCH2, 1-C4H8, iso-C4H8, 2-C4H8, C2H2 are, respectively, 1.00, 0.68, 0.27, 0.10, 0.11, and 0.072. Similar variations in the relative rate constants of the H2-transfer reaction C sub n H sub m (plus) cyclo-C6H12 yields C sub n H sub m plus 2 plus C6H10 plus are noted. The following additional information was derived in the course of the study: (1) When cyclopentane or n-pentane is substituted for cyclohexane in the reaction mixture, the H2-transfer reaction again occurs. Under comparable experimental conditions, the probability of the H2-transfer reaction is proportional to the yield of the parent ion as derived from the 70-eV mass-spectral cracking patterns. (2) An increase in the pressure of cyclopentane, from 12.7 to 210 mm, leads to approximately a 50% increase in the yield of the parent ion of cyclopentane. (3) The parent cyclohexane ion undergoes a charge transfer to NO at a rate which is comparable to the rates of the H2-transfer reactions. O2 does not interact with the parent ion. (4) The cyclopropane-d sub 6 parent ion reacts with cyclo-C6H12 to form CD3CDHCD2H, indicating that this ion acquires the propylene ion structure prior to or during reaction. (Author abstract) ##

01875

M. F. Brunelle, J. E. Dickinson, and W. J. Hamming

EFFECTIVENESS OF ORGANIC SOLVENTS IN PHOTOCHEMICAL SMOG FORMATION (SOLVENT PROJECT, FINAL REPT.). Air Pollution Control District, Los Angeles County, Calif., Evaluation and Planning Div. July 1966. 188 pp.

The principal objective of this study, the determination in an environmental chamber of the smog-forming potentials of individual organic solvents likely to be emitted to the atmosphere, was accomplished and it is now possible to reach certain conclusions based on these data. By compound types, the effects to which each solvent group was found to contribute can be summarized as follows: (1) Aromatic hydrocarbons, except benzene, contribute substantially to aerosol formation, rapid O3 formation, eye irritation and total aldehyde formation. (2) Chlorinated hydrocarbons exhibit almost greater O3 forming activity than the aromatics. Eye irritation was moderate to severe, depending upon the test conditions, and aerosol formation was negligible. On the basis of an experiment with tetrachloroethylene (8 ppm) and NO (2 ppm), alone, it is concluded that most of the activity of the mixed chlorinated solvent may be attributed to trichloroethylene. (3) Aliphatic hydrocarbons (alkanes), both high-boiling and low-boiling, contribute primarily to O3 formation. They also produce total aldehyde concentrations comparable with those produced by irradiation of auto exhaust. The high-boiling alkanes tested tend to exhibit greater reactivity than the low-boiling materials. (4) Ketones contribute significantly to O3 formation (0.3 - 0.4 ppm after 5 to 6 hours' irradiation) and, to some extent to eye irritation, though mostly at higher concentrations or with mixtures. As with several other solvents, aerosol formation is negligible. A single test with

acetone (8 ppm) and NO (2ppm) showed little activity by this compound with respect to ozone formation or aerosol formation, and only very slight eye irritation was indicated. Data indicate that the branched ketones are considerably more reactive than straight-chain ketones. (5) Alcohols are the least active class of compounds tested.##

01878

F. Cramarossa and H. S. Johnston

INFRARED ABSORPTION BY SYMMETRICAL NO3 FREE RADICAL IN THE GAS PHASE.. J. Chem. Phys. 43, (2) 727-31, July 15, 1965.

A new infrared absorption band between 1325 and 1375 cm to the minus one power has been observed in the N205-03 system at low pressure in an 80-m path-length cell. In such systems the presence of the symmetrical NO3 free radical is well known in terms of its visible absorption spectrum, which varies in the unusual way of Kss(N205) to the one third power (03) to the one third power. The new infrared band lies at a frequency just below that for the antisymmetric stretch of the symmetrical planar nitrate ion; the absorption optical density varies as (N205) to the one third power (03) to the one third power; and the new absorption has been assigned to the symmetrical NO3 free radical. (Author abstract)##

C1880

K. W. Egger and S. W. Benson

IODINE AND NITRIC OXIDE CATALYZED ISOMERIZATION OF OLEFINS. V. Kinetics of the Geometrical Isomerization of 1,3-Pentadiene, a Check on the Rate of Rotation about Single Bonds, and the Allylic Resonance Energy. J. Am. Chem. Soc. 87, (15) 3314-9, Aug. 5, 1965.

The kinetics of the nitric oxide catalyzed, homogeneous, gas phase isomerization of 1,3-pentadiene have been studied over a temperature range between 126 and 326 degrees. Analysis of the data shows that the rate-controlling step in the NO-catalyzed geometrical isomerization of pentadiene is the rotation about the single bond in the intermediate radical. Iodine is shown to form a much more stable intermediate radical, and results indicate that, in the I2-catalyzed system, the addition reaction of I atoms is rate controlling. The rotational rate constant log kc was calculated to be (11.5 plus or minus 0.3) - (5.3 plus or minus 1.0)/theta sec. compared to (11.2 - (3.8)/theta sec.) as reported earlier for the iodine catalyzed cis-trans isomerization of 2-butene. (Author abstract modified)##

01881

K. W. Egger and S. W. Benson

NITRIC OXIDE AND IODINE CATALYZED ISOMERIZATION OF OLEFINS. IV. Thermodynamic Data from Equilibrium Studies of the Geometrical Isomerization of 1,3-Pentadiene. J. Am. Chem. Soc. 87, (15) 3311-4, Aug. 5, 1965.

The measurement of equilibrium constants of the iodine-catalyzed gas phase reactions of olefins and their parent hydrocarbons has been shown to be a very simple, direct, and valuable method to determine precise differences in the thermodynamic properties of the reactants. Applied to the cis-trans isomerization of 1,3-pentadiene, the present paper reports an appreciable amount of side reactions and considerable difficulties in product separation. This result is in contrast to the clean-cut experiments on the isomerization of 2-butene. The important two side reactions, the polymerization of 1,3-pentadiene and the formation of diiodide in the lower temperature range, are shown to be a consequence of the considerably more stable radical intermediate formed with 1,3-pentadiene compared to 2-butene. The NO-catalyzed system showed excellent reproducibility and no measurable side reactions. NO2 gave rise to the same difficulties obtained with the iodine catalysis. This is to be expected from the C-ONO bond strength of about 54 kcal.##

01888

R. E. Rebbert and P. Ausloos

QUENCHING OF THE TRIPLET STATE OF ACETONE AND BIACETYL BY AZOALKANES. J. Am. Chem. Soc. 87, (9) 1847-52, May 5, 1965.

It is shown that small concentrations of azoalkanes quench the phosphorescence emitted by acetone and biacetyl, but they do not affect their fluorescence. In the case of acetone the relative quenching efficiencies of nitric oxide, azomethane, and oxygen are 2.8:2.2:1.0 and for biacetyl the efficiencies of azoethane, azomethane, nitric oxide, and oxygen are 19:15:6.7:1.0. It is suggested that the ketone molecule can transfer its triplet state energy to form a triplet excited azoalkane molecule. The photochemistry of the energy-transfer reaction was studied in order to obtain additional information about the fate of the triplet excited azoalkane molecule. A fraction of these triplet excited molecules, formed by the energy transfer from acetone-d6, decomposes into a nitrogen molecule and two alkyl radicals. The remainder of the triplet azoalkane is collisionally deactivated to the ground state. At 30 degrees and an acetone-d6 concentration of 8 x 10 to the minus 3 mole/l., the quantum yield of nitrogen formation is 0.31, independent of the concentration of azomethane from 0.4 x 10 to the minus 4 to 8.8 x 10 to the minus 4 mole/l. The substitution of azomethane-d6 or azoethane for azomethane under comparable conditions results in a decrease in the

quantum yield of nitrogen while the quantum yield of carbon monoxide is essentially constant. This indicates a longer dissociative lifetime for the triplet azomethane-d6 or azoethane compared to azomethane. (Author abstract)##

01889

B. C. Sahni and E. J. DeLorenzo

ELECTRONIC STATES OF MOLECULES. I. Self-Consistent Field Calculations of the Ground, Ionized, and Excited States of N2 and O2. J. Chem. Phys. 42, (10) 3612-20, May 15, 1965. (Presented at the Symposium for Molecular Structure and Spectra, Ohio State Univ., Columbus, Ohio, June 1964.)

A number of electronic states of N2 and O2 have been computed using the self-consistent-field-molecular orbital (SCF-MO) method. The calculated ionization, excitation, and total energies are compared with the available experimental data, as well as with those reported by other workers. (Author abstract)##

01961

G. R. McMillan, J. G. Calvert, and J. N. Pitts, Jr.

DETECTION AND LIFETIME OF ENOL-ACETONE IN THE PHOTOLYSIS OF 2-PENTANONE VAPOR. J. Am. Chem. Soc. 86, 3602-5, Sept. 20, 1964.

The formation of the enol form of acetone in the "type II" primary photochemical process in methyl ketones containing gamma-hydrogen atoms has received general acceptance in recent years on the basis of published indirect evidence. In this work a direct observation of the transient enol form of acetone has been made by infrared absorption during the photolysis of 2-pentanone. The enol to keto conversion was studied by following both the disappearance of the enol and the appearance of the keto form using long-path infrared techniques. The half-life of enol-acetone is about 3.3 min. at 27 degrees and 750-mm. total pressure. The ketonization process seems to occur mainly at the reaction vessel wall. Photolyses of 2-pentanone were also carried out in small reaction vessels pretreated with D20. In this case the keto-acetone ultimately produced is partly monodeuterated, and a partial exchange of the enol form at the vessel wall is indicated; this result is similar to that reported by Srinivasan in experiments with 2-hexanone. The extent of exchange exhibits a peculiar dependence on the residence time in the cell which complicates the interpretation of the ketonization step under these conditions. (Author abstract)##

01978

A. P. Altshuller, I. R. Cohen, S. F. Sleva, and S. L. Kopczynski

AIR POLLUTION: PHOTOOXIDATION OF AROMATIC HYDROCARBONS. Science 138, (3538) 442-3, Oct. 19, 1962.

A number of aromatic hydrocarbons participate as effectively as the olefins in atmospheric photooxidation reactions in the presence of nitrogen oxides and ultraviolet light. Judged both on the basis of reactivity and concentrations in the atmosphere, the aromatic hydrocarbons cannot be ignored as contributors to the photochemical type of air pollution. (Author abstract) ##

01990

A. Goetz and T. Kallai

THE SYNTHESIS OF DEFINED AEROSOL SYSTEMS. Am. Ind. Hyg. Assoc. J. 24, 453-61, Oct. 1963.

Instrumentation and procedures for the synthetic production of photochemical aerosols within a laminar airflow along a tubular channel are described. Special micro-dosimetry quantitatively facilitates continuous addition of reactive trace components (hydrocarbons, NO, NO2, SO2) and of defined nucleating particulates. The flow is subsequently irradiated symmetrically in the spectral range (320-450 millimicrons) in a special channel section without temperature increase, at adjustable intensity levels and exposure durations up to several times solar intensity at ground level. The resulting aerocolloidal components are analyzed with the Aerosol Spectrometer for determining the size and mass distribution of the photoactivated particulates at various reaction stages. Examples of smog-type reactions between traces of NO2 and olefins, and of modifications of natural aerosols, are presented. (Author abstract) ##

02082

E. Sawicki, T.W. Stanley, J. Pfaff, H. Johnson

SENSITIVE NEW METHODS FOR AUTOCATALYTIC SPECTROPHOTOMETRIC DETERMINATION OF NITRITE THROUGH FREE-RADICAL CHROMOGENS. Anal. Chem. 35, (13) 2183-91, Dec. 1963.

Many of the methods presented here are more sensitive than any described in the literature. A molar absorptivity of 1,270,000 can be obtained in the 1-methyl-2-quinolone azine procedure, while in most other procedures molar absorptivities average over 200,000. The following reagents are compared: 1-methyl-2-quinolone azine, 3-methyl-2-benzothiazolinone azine,

glycoxal bis (N,N diphenylhydrazone), 3-methyl-2-benzothiazolinone picrylhydrazone, phenothiazine, N,N,N',N'-tetramethyl-4,4'-diaminostilbene, N,N' - diphenyl p - phenylenediamine, N,N,N',N-tetramethylbenzidine, N,N,N',N'-tetramethyl - p - phenylenediamine, and N,N,N' - trimethyl - p - phenylenediamine. The syntheses of some of the reagents are given. Evidence is prrsented that free radicals are obtained in all the procedures. The advantages and disadvantages of the methods are discussed. Recommendations are given for application of some of the procedures to the analysis of solutions containing dyes, large amounts of sulfite, or minute amounts of nitrite. (Author abstract) ##

02203

B.D. Tebbens, J.F. Thomas, M. Mukal

FATE OF ARENES INCORPORATED WITH AIRBORNE SOOT. Am. Ind. Hyg.. Assoc. J. 27, (5) 415-22, Oct. 1966.

Modification of airborne arenes by environmental factors is significant not only because of possible reduction or enhancement of biologic effect on humans in contact with air contaminants, but also of the difficulty in relating arene sources to the compounds found in air. Smoke as an experimental source of arenes was diluted, then irradiated in a 22-ft. dynamic flow chamber. Samples were collected before and after irradiation and determination of concentration of 2 arenes, benzo(a) pyrene and perylene, and particle sizes were made. Irradiation caused partial modification or disappearance of the arenes by 35-65% of the original content. Without irradiation an apparent increase of arenes was noted and this was thought to be a function of the system and particle size factors. The presence of oxygen increases the degree but is not necessary for the modification of arenes. (Author abstract modified) ##

02243

R.E. Rebbert P. Ausloos

THE REACTIONS OF METHYL RADICALS IN THE SOLID-, LIQUID-, AND GAS- PHASE PHOTOLYSIS OF DIMETHYLMERCURY. J. Am. Chem. Soc. 85, 3086-9, Oct. 20, 1963.

The gas-phase photolysis of CD3COCD3 has been investigated in the presence of CH3HgCH3 from 376 to 453 K. From the isotopic distributions of the methane and ethane fractions, evidence was obtained for the occurrence of the reaction: CO3 plus CH3HgCH3 yielding CD3HgCH3 plus CH3 (Energy of activation equals 12.6 kcal./mole). This reaction is also postulated to occur in the liquid-phase photolysis of dimethylmercury. From the isotopic distribution of the ethane

produced in the liquid- and solid- phase photolysis of CH3HgCH3-CD3HgCD3 mixtures, it was concluded that cage recombination of methyl radicals does take place. Contrary to the conclusions reached in an earlier work by Derbyshire and Steacie, no evidence could be obtained for hot methyl radical effects in the liquid-phase photolysis of dimethylmercury. (Author abstract)##

02258

G. A. Oldershaw and R. J. Cvetanovic

PHOTOCHEMICAL ADDITION OF HYDROGEN BROMIDE TO 2-BUTENE IN THE GAS PHASE. J. Chem. Phys. 41, (11) 3639-44, Dec. 1, 1964.

The relative rates of the photochemical addition of hydrogen bromide to 2-butene, and of the simultaneous cis-trans isomerization have been measured in the gas phase at 54 C. Similar but less extensive experiments have been carried out with 1,2-dideuteroethylene. In this case, comparison of the rates with the data in the literature indicates much faster cis-trans isomerization than can be expected from the decomposition of thermalized bromoethyl radicals. Alternative explanations of the fast geometric isomerization are briefly discussed.##

02286

C.P. Fenimore G.W. Jones

THE WATER-CATALYZED OXIDATION OF CARBON MONOXIDE BY OXYGEN AT HIGH TEMPERATURE. J. Phys. Chem. 61, 651-4, May 1967.

By sampling burnt gases from lean flat hydrocarbon flames at one atmosphere pressure, the oxidation rate in the presence of ample water at 1700-2000K is determined to be - 1/(O2) (dln(CO)/dt) + 1.2 x 10 to the 9th power e to the -24,000/RT/(moles/l)/sec. In burnt gas from CO flames containing very little water, -dln(CO)/dt is independent of oxygen and roughly proportional to water. The slower rate of comparatively dry CO flames is raised toward the value appropriate to hydrocarbon flames by adding hydrogen to the CO. A partial mechanism is suggested which is consistent with these results. (Author abstract)##

02309

G.K. Sobolev

HIGH-TEMPERATURE OXIDATION AND BURNING OF CARBON MONOXIDE. Symp. Combust., 7th, London, Oxford, 1958. 386-91, 1959.

The purpose of this study was to measure the rate of burning of CO in the flame front, using the results of normal flame

velocity measurements for this purpose, and simultaneously to make direct measurements of the rate of oxidation of CO in the afterburning zones of the same flames. A comparison of the data obtained by these two independent methods will evidently be of theoretical and of practical value.##

02328

R. C. Gunton and T. M. Shaw.

AMBIPOLAR DIFFUSION AND ELECTRON ATTACHMENT IN NITRIC OXIDE IN THE TEMPERATURE RANGE 196 TO 358 K. Phys. Rev. 140, (3A) A748-A755, NOV. 1, 1965.
CFSTI, DDC AD 634223

Ambipolar diffusion and electron attachment rates were measured in nitric oxide at pressures from 0.01 to 16 Torr and at temperatures from 196 to 358 K. The gas was photoionized by single pulses of ultraviolet radiation, at and near Lyman alpha from a hydrogen lamp. Pulse lengths ranged from 10 to 300 microsec and ionization levels were kept low to reduce electron-ion recombination. Rates for the latter process are reported in a separate paper. *Electron loss rates were* measured by a microwave-cavity method used to record the decay following a single ionizing pulse. Ion identification was made by a mass spectrometer which sampled the ions diffusing through a small hole in the wall of the microwave cavity. Ultrahigh-vacuum techniques were used in gas purification and in production and measurements of ionization. The diffusion results are to some extent consistent with theory of diffusion of electrons and a single positive ion species in the presence of negative ions. The mass-spectrometer observations indicate that NO plus is the dominant positive ion in photoionized NO at all pressures. The principal negative ion observed with the mass spectrometer was NO2(-), and no NO(-) or NO2(-) ion were detected. Direct attachment ot NO2, present as a minute impurity, seems unlikely; the NO2(-) ion may be formed by rapid charge transfer from a primary negative ion or by an attachment reaction involving rearrangement. (Author abstract modified)##

02337

D. Phillips.

PHOTOLYTIC PROCESSES IN PERFLUOROCYCLOBUTANONE VAPOR. J. PHYS. CHEM. 70, (4) 1235-43, APR. 1966.
CFSTI, DDC AD 635437

The photolysis of perfluorocyclobutanone in the vapor phase at 3130, 3340, 3660, and 4047 A has been investigated. Fluorescence and decomposition yields have been determined at the four wavelengths and the effects of pressure and temperature upon them studied. Two modes of decomposition occur at the shortest wavelengths and at high temperatures, one producing carbon monoxide and perfluorocyclopropane, the other producing

tetrafluoroethylene. A mechanism is proposed which explains the results, and rate constants for reactions are determined. Results indicate that about 7 kcal/mole excess vibrational energy can be removed from the excited ketone by each collision with an unexcited ketone molecule. (Author abstract)##

02412

A. Goetz R. Pueschel

THE EFFECT OF NUCLEATING PARTICULATES ON PHOTOCHEMICAL AEROSOL FORMATION. J. AIR POLLUTION CONTROL ASSOC. 15, (3) 90-5, Mar. 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, Berkeley, Calif., Jan. 6-7, 1964.)

The role of nucleating particulates in the formation of photochemical aerosols was studied in a steady, laminar flow of ultrafiltered air containing NO2 and octene-1 in the concentration range of: (30 - 170 ppm), when subjected to intense irradiation under isothermal conditions. The particulates consisted of monodisperse polystyrene latex (d equal 0.36 micron) in concentrations similar to those in the atmosphere; the irradiation intensity varied between: (6 - 40,000 lumne/liter) and the mean exposure duration between 30 - 180 sec. Samples of the flow, prior to and after its photoactivation, were withdrawn either by an Aerosol Spectrometer (AS) or by a Royco Aerosol Photometer. The photometric data include all colloidal components in the airborne state, whereas the counts obtained from the AS-deposits refer only to the nucleated latex particles. The following pattern is evident: The photochemical reaction yields fractional products (less than 3%) which have the tendency to agglomerate (or polymerize) due to their relatively low volatility--independent of the presence or absence of nucleating particulates. The growth process appears principally different from that of fog formation by H2O)-condensation, where, for identical supersaturation, it is inversely proportional to the nuclear concentration. In the absence of nuclei, autonucleation, i.e. self-agglomeration, occurs at a much lesser reaction rate and higher photon demand. The growth rate of the nuclei, when present, depends on the concentration of the oxidation catalyst (NO2). Under identical conditions the mass of nuclear accumulant is directly proportional to the concentration of the reactive hydrocarbon, while the growth rate depends on the light intensity and the exposure duration. The findings indicate that density and nature of particulate matter present in an air mass prior or during photo-activation are, aside from the chemical reactant levels, of major significance in aerosol formation. (Author abstract modified)##

C2443

HYDROCARBON - AIR FUEL CELLS. General Electric Co., Lynn, Mass., Direct Energy Conversion Operation. (Technical Summary Rept. No. 8, July 1-Dec. 31, 1965). 266p., 1965
CFSTI AD 479005

Detailed information is presented on a continuing research and development program to develop a direct hydrocarbon oxidation-air fuel cell technology. Current work included research on electrochemical oxidation processes, electrocatalysts, electrolytes, electrode structures, and fuel cell life testing. Multi-pulse potentiodynamic techniques have been further developed for analyzing hydrocarbon surface processes. Performance of fuel cell systems with hydrogen fluoride and phosphoric acid electrolytes have been studied for high performance hydrocarbon oxidation. Boron carbide and carbon have been successfully employed as substrates for high surface area platinum and the results and application to Teflon-bonded electrodes are reported. A variety of modified Teflon-bonded developmental electrodes were evaluated. (Author abstract) ##

02445

G. W. Griffin

PHOTOCHEMISTRY OF UNSATURATED CARBONYL DERIVATIVES AND RELATED SMALL RING SYSTEMS (FINAL REPT. JULY 1, 1963-DEC. 31, 1965.)
Tulane Univ., New Orleans, La., Dept. of Chemistry
(AROD Rept. No. 4375:11.) 28 pp., June 1, 1966
CFSTI AD 635217

The photofragmentation of a variety of small ring homo- and heterocyclic systems including cyclopropanes, epoxides, aziridines, oxaziranes and spisulfides are studied. The photorearrangement of cyclopropanes to olfins and the photoinduced conversion of cyclopropenes to indenes also are examined. The studies are complementary and those parameters which determine the reaction course are defined in each case. For example, it is of interest to determine why certain cyclopropanes fragment to carbenes and others simply rearrange to isomeric olefins. Many of those reactions described have synthetic utility and heretofore inaccessible systems now have been synthesized. The photofragmentation of stilbene oxide is illustrative and appears to be the method of choice for preparing phenylcarbenes and thus phenylcyclopropanes and cyclopropenes. ##

02446

K. O. Hartman and I. C. Hisatsune

INFRARED SPECTRUM OF CARBON DIOXIDE ANION RADICAL. J. Chem. PHYS. 44(5) 1913-8, MAR. 1, 1966.
CFSTI, DDC AD 635357

Pressed alkali halide disks of infrared spectroscopy have been used as matrices to trap and to stabilize the carbon dioxide anion free radical. The radical was generated by exposing disks containing the formate ion in solid solution to gamma rays from a cobalt source. The ESR, the ultraviolet, and the infrared spectra of the radical have been identified. From the carbon-12

and-13 isotopic frequencies of the antisymmetric CO-bond stretching infrared band, a valence angle of 127 degrees plus or minus 8 degrees was calculated for this radical. The radical reacted with water to produce bicarbonate and formate ions. (Author abstract)##

02456

A.V. Phelps W.H. Kasner

STUDIES AND EXPERIMENTAL WORK ON ATOMIC COLLISION PROCESSES OCCURRING IN ATMOSPHERIC GASES. Westinghouse Research Labs., Pittsburgh, Pa. (Technical Rept. AFWL-TR-66-34.) pp. 73. May 1966

Temperature dependent recombination studies in nitrogen have been conducted over the range 200-480 K, yielding a coefficient of (2.9 plus or minus 0.3) x 10 minus 7/cum/sec. for the recombination of N2(+) ions and electrons. The observed temperature dependence is quite small, being adequately described by the relation T to minus .02. Several modifications have been made on the flow system used in the study of associative detachment in O2 minus O mixtures. In subsequent studies a reaction resembling associative detachment has been observed. While preliminary tests were being conducted on the rf mass spectrometer which is to be used on the flow system, a brief study of negative ion-molecule reactions was made. Rate coefficients for several of these reactions were measured. A summary of the results of a calculation of momentum transfer and inelastic cross sections for electrons in oxygen is presented. The computed momentum transfer cross section is in satisfactory agreement with electron beam results but it differs significantly from the cross section obtained at thermal energies from microwave experiments. (Author abstract)##

02464

H. Sjogren E. Lindholm

IONIZATION AND DISSOCIATIVE IONIZATION OF O2 AFTER ELECTRON AND IMPACT. Royal Inst. of Tech., Stockholm, Sweden, Dept of Physics. (Scientific Rept. 4 and Rept. AFCRL-66-436.) DEC. 15, 1965. 24 PP.

The ionization of O2 was investigated by using charge exchange in a double mass spectrometer. The breakdown graph was constructed. A break in the electron impact ionization efficiency curve is explained as being due to ion-molecule reactions between excited O plus or minus ions formed in an ion/pair process, and O2. It was shown that the cross sections must be very small for the reaction, O+ (4S) + O2 yields O+O2 plus or minus since the cross sections for the corresponding reaction with Si plus or minus are small. Implications for the aeronomy are discussed. (Author abstract)##

02472

S.S. Wilks

PRELIMINARY STUDIES ON LIGHT-INDUCED CARBON MONOXIDE IN CLOSED ENVIRONMENTS. School of Aerospace Medicine, Brooks AFB, Tex., Aerospace Medical Division. Sept. 1963. 9 pp.
CFSTI, DDC AD 420946

Experimental data is presented concerning the effects of solar light upon certain classes of organic substances which may be components of the sealed environment of space vehicles. Many materials such as organic plastics, pigments, insulating material, etc., will, when exposed to light in the presence of oxygen, liberate a number of toxic end products such as carbon monoxide, aldehydes, acids and certain hydrocarbons. In a sealed environment these agents may reach levels toxic to human beings during a long sojourn in a sealed system. Therefore, along with products that may result from thermal and electrical activity (motors, generators, etc.), these products may constitute a considerable hazard in sealed environments. (Author abstract)##

02489

J. K. S. Wan and J. N. Pitts, Jr.

A SPECTROSCOPIC INVESTIGATION OF THE REACTION BETWEEN IODINE AND CYCLOPROPYLAMINE. Tetrahedron Letters, 44:3245-50, 1964

The reaction between iodine and cyclopropylamine in n-heptane solution was studied spectroscopically. Preliminary results suggest that 1:1 charge-transfer complex between iodine and cyclopropylamine was formed first; subsequently precipitation of white crystals of a 2:1 cyclopropylamine-iodine complex, C3H5NH2)2 I2 (A), occurred. Evidence suggests that the solid product (A) has probably an ionic structure.##

02493

J. K. S. Wan, L. D. Hess, and J. N. Pitts, Jr.

FREE-RADICAL ADDITION TO AZOBENZENE IN CUMENE SOLUTION. ELECTRON PARAMAGNETIC RESONANCE SPECTRA OF SOME LONG-LIVED RADICAL INTERMEDIATES. J. Am. Chem. Soc. 86, 2069-70, 1964

A degassed solution of azonbezene in cumene was irradiated at room temperature in the microwave cavity of Varian V 4500 e.p.r. spectrometer with 100-kc. field modulation. Light source was a PEK mercury high pressure lamp equipped with filters which absorbed wave lengths shorter than 4000A. At room temperature irradiation, a spectrum was observed with an intensity dependent upon the initial concentration of azobenzene. The spectrum is a

triplet, each component of which contains 4 groups of lines with intensities following a 1:3:3:1 binomial distribution. Each of the groups is further split into 3 lines. The radical structure consistent with observed spectrum is composed of the azobenzene and cumene structures joined at a nitrogen atom and the tert-carbon atom. Experimental coupling constants and experimental and theoretical spin densities are tabulated. Separate experiments on a larger scale in which the reaction was subjected to liquid chromatography resulted in N,N'-Dephenyl-N-(1-methyl-1-phenylethyl) hydrazine being eluted. Its identity was confirmed by IR and n.m.r. analysis.##

C2494

H. W. Johnson, Jr., J. N. Pitts, Jr, and M. Burleigh.

POSSIBLE FORMATION OF CROSSED PINACOLS IN THE PHOTOLYSIS OF BENZOPHENONE MIXTURES. Chem. Ind. (London) 1493. 1964

Vacuum degassed binary mixtures of benzophenone, 4,4 dichlorobenzophenone and 4,4-dimethoxybenzophenone in 3:1 benzeneisopropyl alcohol solvent at room temperature were photolysed using a Hanovia Type A mercury are filtered to remove radiation below 3000A. Equimolar and equiabsorbance solutions were studied with no significant difference in the results. No crossed pinacol was found in the photolysed mixtures of 4,4-dimethoxybenzophenone with benzophenone or 4,4 dichlorobenzophenone. However, an equimolar mixture of 4,4'-dichlorobenzophenone with benzophenone (0.53m) yielded 15-20% of the "crossed" pinacol, the balance being a mixture of the symmetrical pinacols. Since both ketones are being excited by the incident radiation, the non-formation of "crossed" pinacols in two of the three cases studied indicates that transfer of the excitation energy from one ketone to the other is occurring. This transfer may occur in excited state of the ketones, or it could occur as a hydrogen atom transfer in the ketyl radical intermediates. The elegant demonstration of triplet transfer by Hammond and others makes this mechanism an attractive one; experimental justification is being sought.##

02496

J. N. Pitts, Jr., P. A. Schuck, and J. K. S. Wan.

PHOTOREDUCTION OF 2,2-DIPHENYL-1-PICRYLHYDRAZYL (DPPH) IN HYDROCARBONS. J. Am. Chem. Soc. 86, 296-7, Jan. 20, 1964.

Preliminary results of an e.p.r. investigation of the photo-induced abstraction of hydrogen atoms from hydrocarbons by 2,2-diphenyl-1-picrylhydrazyl (DPPH) are reported. Light absorption by DPPH solutions at 3130 A was determined by using the photochemical disappearance of benozphenone and the formation of acetone in isopropyl alcohol as the actinometer. In the dark no diminution of e.p.r. signal intensity was observed. During irradiation the signal decreased according to the first-order rate law. An equation for determining the reaction rates of DPPH in different hydrocarbon solvents using the quantum yield is given.##

02498

J. K. S. Wan, E. A. Schuck, J. K. Foote, and J. N. Pitts, Jr.

THE FORMATION OF TRIBUTYLIODOAMMONIUM IODIDE IN THE URANYL PHOTOSENSITIZED REACTION WITH TETRABUTYLAMMONIUM IODIDE. Can J. Chem. 42, 2029-31, 1964

The reaction of tetrabutylammonium iodide in aqueous solution sensitized by uranyl nitrate is reported and is disclosed a photochemical method for preparing tributyliodoammonium iodide. When an aqueous solution of uranyl nitrate and tetrabutylammonium iodide (I) was irradiated at room temperature with the 3660 A line from a mercury vapor lamp, a black precipitate was formed. In the absence of light, no precipitation was observed. The identity of the precipitate as tributyliodoammonium iodide (C4H9)3IN(+)I(-) (II), was confirmed by elementary analysis, molecular weight determination, infrared and nuclear magnetic resonance (n.m.r.) analyses. The molecular weight was found experimentally to be 442: calculated for II is 439. The IR spectrum was consistent with that expected for II. The n.m.r. spectrum exhibits three complex multiplets centered on r values of A, 8.90, B, 8.40 and C, 6.75; with integrated areas being in the ration 1.55:2:1. Peak A can be assigned to the methyl protons (9H), peak B to the methylene protons (12H), and peak C to the protons (6H) adjacent to the nitrogen atom. The UV spectrum taken in ethanol solution showed an absorption onset at 5000 A with maxima at 3650 and 3200 A. The product II exists at room temperature as a black powder with a melting point of 65-68 C. The compound is stable at least up to 135 C, and exhibits a reversible thermochromic phenomenon (from black to yellow) when warmed to 88 C or higher. The IR spectra of both color forms do not show any drastic changes. The experimental data obtained to date are insufficient to establish the entire reaction mechanism, but seem to suggest that oxidation of the iodide ion is sensitized by the photoexcited uranyl ions, leading to an iodine atom and solvated electron. Hte direct photolysis of a aqueous solution of I also was carried out by light shorter than 3000 A. A black precipitate of II was recovered together with some free iodine.##

02503

J. G. Atwood

ABSORPTION OF LIGHT IN GASES. Perkin-Elmer Corp., Norwalk, Conn., Electro-Optical Div. (PE Engineering Rept. No. 8361) 38 pp. 1966.

Two methods of measuring optical molecular absorptivities in gases were studied. An acoustic method was pushed experimentally to a sensitivity of 10 to the -5 power/cm absorptivity. The second method, a laser illuminated "spectrophone", is now being investigated. Both methods use a Q-switched ruby laser, tunable from pulse to pulse over a 2A range, as the excitation

source. Absorbed light causes a temperature rise and expansion of the gas sample. In the acoustic method the expansion starts cylindrically propagating sound disturbances. These are focused by acoustic mirrors onto a membrane detector. n the spectrophone method the gas sample is enclosed in a sealed glass tube. The gas expansion causes a pressure rise which is transmitted to the membrane detector through a short duct. The membrane is one reflector of a near confocal resonator, illuminated by a frequency stable gas laser. Small membrane displacements are detected as fringe motion across a sensing prism by two photomultiplier tubes. Large displacements are averted by a servo loop which applies the photomultiplier difference signal to electric grids, forcing the membrane to stay within one order of the resonator. The loop feedback signal is a calibratable measure of the gas optical molecular absorptivity at the wavelength of the ruby laser pulse. One practical problem of the acoustic method is the high frequency and transient nature of the signal. The longest wavelength is twice the laser beam diameter, so the signal frequencies are 300 kHz and higher. The membrane must be very thin to respond to such high frequencies and its displacement is typically less than 1A. The membrane reflectivity cannot be made greater than 60%, so the resonator fringes have low finesse. These practical difficulties make shot noise in the fringe-reading photometer, rather than Brownian noise the limit of performance. In the spectrophone, high frequency problems are avoided. The observation time is 30 milliseconds, set by thermal diffusion from the gas sample to the tube walls. The membrane can be much thicker and still have a 12mbd2/10 displacement for a typical pressure rise of 1 dyne/sq cm. Initial experiments indicate great sensitivity with the spectrophone. (Author abstract)##

02504

02504
V. D. Baiamonte, D. R. Snelling, and E. J. Bair

VIBRATIONAL ENERGY OF OZONE DURING PHOTOLYTIC EXPLOSION.
J. Chem. Phys. 44, (2) 673-82, Jan. 15, 1966.
CFSTI, DDC AD 633291

Following a short photolysis of the proper energy the absorption spectrum in the region of the ozone Uv system, a continuum centered at about 2550 A, broadens and shifts toward longer wavelength as the reaction proceeds. Kinetic measurements of this shift over a period of 200 microsecs following a mild photolysis flash of 12 microsecs duration in 0.5 Torr pure ozone are interpreted in terms of population of ozone vibrational energy states by exchange of energy with vibrationally excited oxygen formed during the exothermic decomposition. Considerable 02-03 vibrational equilibration occurs within 50 microsecs. A semi-empirical model which correlates the ozone vibrational temperature and the observed data is discussed in relation to the over-all energetics of ozone decomposition. (Author abstract)##

C2508

D. G. Clifton

APPROXIMATE THERMODYNAMIC FUNCTIONS FOR THE NO2(G) ION (TECHNICAL REPT.). General Motors Corp., Santa Barbara, Calif., GM Defense Research Labs., Aerospace Operations Calif., Defense Research Labs., Aerospace Operations Dept. May 1966. 13 pp.
DDC AD 484367

Approximate values for the free-energy function, enthalpy function, entropy, and constant-pressure heat capacity have been computed and tabulated for the temperature range from 300 K to 6000 K for the NO2 (g) ion. (Author abstract)##

C2517

D. Marsh and J. Heicklen

PHOTOOXIDATION OF PERFLUOROETHYL IODIDE AND PERFLUORO-N-PROPYL IODIDE. Aerospace Corp., El Segundo, Calif., Lab. Cperations. Apr. 1966. 11 pp.
DDC: AD 483914

Perfluoroethyl iodide and perflucro-n-propyl iodide were photolyzed in the presence of oxygen. In both cases, the major product is CF20. In the C2F51 system, it is produced with a quantum yield of about 2.0. CF3CFO is also produced, but is 100 times less important. With HI present, the oxidation is drastically modified, and the RO2 intermediate must live at least 10 to the 7th sec. (Author abstract)##

02528

T. F. Thomas and C. Steel

PHOTOINITIATION OF UNIMOLECULAR REACTIONS. THE PHOTOLYSIS OF 2,3-DIAZABICYCLO(2.2.1)HEPT-2-ENE. J. Am. Chem. Soc. 87, (23) 5290-3, Dec. 1965

The gas-phase photolysis of 2,3-diazabicylo(2.2.1)hept-2-ene (I) with 337-millimicrons light has been investigated in the pressure range 10-1000 microns. The variation in the yields of hydrocarbon products, bicyclo(2.1.0)pentane (II), cyclopentene (III), and 1,3-cyclopentadiene (IV), with pressure is consistent with the initial formation of "hot" II which can either be deactivated or isomerized to "hot" III. The latter can either undergo unimolecular decomposition to yield IV or be deactivated. Changing the wave length of irradiation from 313 to 334 millimicrons changed the relative yields of the products in a manner consistent with this "hot" molecule mechanism. (Author abstract)##

02534

H. S. Johnston and J. Heicklen

PHOTOCHEMICAL OXIDATIONS. III. ACETONE. J. Am. Chem. Soc. 86, 4249-54, Oct. 20, 1964.

The room-temperature photooxidation of acetone (0.25 to 17 mm.) in oxygen (0.09 to 9.7 mm.) with continuous UV radiation above 2200 A. was studied by the method outlined in part I of this series; observations were made by leaking the reaction mixture directly into the electron beam of the mass spectrometer during photolysis. The principal products of the reaction were H2CO, H2O CH3OH, and CH3OOH; minor products were CH3COOH, HC3OOCH3, and higher molecular weight products which were probably CH3COCHO and CH3COCH2OH. Because of the cracking pattern of the reactants, it was impossible to establish the presence or absence of CH4, CO, CH2CO, and CO2. From the identified products at least 14 free radicals are inferred to be intermediates in this system. An exhaustive and impartial examination of all possible radical-radical disproportionation and recombination reactions indicates that the data excluded a large number of possible reactions but that 140 reactions could still be occurring. Formaldehyde, so far as these studies go, could be formed by 39 different reactions. Thus, this experimental method cannot give a complete mechanism, nor can any method that simply analyzes all molecular products. (Author abstract)##

02535

H. S. Johnston and J. Heicklen

PHOTOCHEMICAL OXIDATIONS. IV. ACETALDEHYDE. J. Am. Chem. Soc. 86, 4254-8, Oct. 20, 1964.

The room-temperature photooxidation of acetaldehyde (0.4 to 18 mm.) in oxygen (1.0 to 9.2 mm.) with continuous uv radiation above 2200 A was studied by the method outlined in part I of this series. Observations were made by leaking the reaction mixture directly into the electron beam of the mass spectrometer during photolysis. The principal products of reaction were CH3OH and presumably CO and CO2; other products were H2O, CH2O, HCOOH, CH3OOH, CH3COOH, CH3OCCH3, and probably CH3C(O)OOG. Because of the cracking pattern of the reactants, it was impossible to establish the presence or absence of CH4, CH2CO, CO, and CO2. Oxidation of the primary radicals, CH3 and HCO, leads to CH3OC, CH3O, HO, and HO2, and probably HCO(OO) and HCCO. There are at least six radicals in this system that can disproportionate in 36 ways and undergo other reactions. Thus this reaction is much too complicated for its mechanism to be revealed merely by analysis of all products. (Author abstract)##

C2734

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION (SIXTEENTH PROGRESS REPT. JULY 1 TO DEC. 31, 1966.) California Inst. of Tech., Pasadena, Chemical Engineering Lab. 1966. 16 pp.

During the period covered by this report, primary effort was directed to the investigation of the effect of the nature of fuels upon the formation of the residual quantities of the oxides of nitrogen and upon the microscopic nature of the perturbations resulting therefrom. Tables summarize results of these studies. Table I sets forth the experimental conditions in connection with the investigation of the behavior of the propane-air and the n-butane-air system. In Table II, the composition of the reaction products of the ethane-air system propane-air and n-butane-air systems are summarized. The analysis of the perturbations in normal stress obtained in connection with the propane-air and ethane-air systems is given in Table III. Plans for continuation of these studies upon the renewal of the Public Health Service Grant No. AP-00108-08 are discussed.

02761

H.H. Reamer B.H. Sage

OSCILLATORY COMBUSTION AT ELEVATED PRESSURES. Preprint. 1966.

The effect of combustion conditions upon the magnitude of the perturbations in normal stress and in total light intensity have been investigated in a cylindrical combustor 1.0 in. in diameter and approximately 24 in. in length. The results are presented in graphical and tabular form. The quantities of oxides of nitrogen for a number of combustion conditions have been included. (Author abstract)##

C2788

G. A. Lutz

PHOTOCHEMISTRY - A GROWING TECHNOLOGY. Battelle Tech. Rev. 15 (11) 11-5, Nov. 1966.

This discussion has reviewed some of the technological achievements that are making photochemistry increasingly important as a production tool. The article has also demonstrated that photochemistry has developed into a methodology of delivering exact amounts of energy that can be used for chemical syntheses, some of which are now the bases of industrial processes. A critical appraisal of the current research effort, and of the developments and processes that have emerged, suggests that photochemistry will be of increasing significance in a number of industrial fields. Thus, it will be important in the manufacture of new chemicals and chemical intermediates for fibers, foods, drugs, solvents catalysts, polymers, and insecticides, and for chemical processes useful in information copying, storage, and retrieval systems.##

02817

S. G. Cohen

ACTION OF MERCAPTAN AND DISULFIDE IN HYDROGEN ATOM EXCHANGE REACTIONS. Brandeis Univ., Waltham, Mass., Dept. of CHEMISTRY (REPT. NYO-2499-16.) MAY 24, 1965. 25 PP.
CFSTI NYO 2499-16

Mercaptan and disulfide form systems very effective in transferring hydrogen atoms to and from free radicals with rate constants of 0.001 - 0.0001 M/sec. Photochemical and high energy radiation processes may convert an initially stable system to one containing free radicals formed by transfer of hydrogen atoms from one molecule to another. Thus both combination and disproportionation of the reaction, M plus NH2 yielding MH plus NH, radicals are thermodynamically favorable processes, but combination reactions lead to the usually observed products. When mercaptan and disulfide are present, they lead to the disproportionation products, returning the system to its initial state. Being used repeatedly, each MH. plus AS yielding M plus ASH yielding NH2 plus AS. molecule of sulfur compound may negate the consequences of many quanta, or afford protection against radiation damage. They may also lead to products different from both the starting materials and the usual products. In free radical and photochemical systems in which transfer of a hydrogen atom is a chain-propagating step and radical combination is terminating, the mercaptan disulfide may provide striking catalysis. In all cases, the reactions of the sulfur compounds do not exclude the usual reactions but are competitive with them. (Author conclusions modified) **

02837

C. S. Tuesday

THE ATMOSPHERIC PHOTOOXIDATION OF TRANS-BUTENE-2 AND NITRIC OXIDE. General Motors Research Labs., Warren, Mich. 1961. 35 pp. (Presented at the International Symposium on Chemical Reactions in the Lower and Upper Atmosphere, San Francisco, Calif., Apr. 18-20, 1961.)

To elucidate the mechanism of the atmospheric photochemical reactions of olefins and nitrogen oxides, the reactions that occur upon the irradiation of oxygen-nitrogen mixtures containing several parts per million of nitric oxide and trans-butene-2 were investigated. Trans-butene-2 was used as a model olefin because of its symmetry and relatively rapid reaction rate. The effects of several variables on the rates of trans-butene-2 disappearance and nitrogen dioxide formation were determined together with the effect of these variables on the concentrations of reaction products. Reaction variables investigated include nitric oxide, nitrogen dioxide, trans-butene-2, and oxygen concentrations as well as light intensity and total pressure. A reaction scheme is proposed to rationalize the observed effects these reaction variables have on the rates of trans-butene-2 and nitric oxide

photooxidation and on the concentrations of reaction products. The experimental results support the general conclusion that a free radical chain reaction initiated by the reaction of oxygen atoms with trans-butene-2 is very important in the atmospheric photo-oxidation of trans-butene-2 and nitric oxide.##

02838

W. A. Glasson, and C. S. Tuesday

THE ATMOSPHERIC THERMAL OXIDATION IN NITRIC OXIDE. General Motors Research Labs., Warren, Mich. 1963. 14 pp. (Presented in part at the 144th National Meeting, American Chemical Society, Los Angeles, Calif., Apr. 5, 1963.)

The kinetics of the thermal oxidation of NO in oxygen nitrogen mixtures have been determined in the parts-per-million range by long-path infrared spectrophotometry. The results of this investigation indicate that the reaction is second-order in NO, first-order in oxygen, and independent of the concentration of added NO2, with a third-crder rate constant, at 23 C, of 1.57 (plus or minus .09) times 10 to the minus 9 power per (sq ppm - mn). It is concluded that the kinetics of the thermal oxidation of NO are adequately described by a simple third-order rate law and do not require the complexities suggested by Treacy and Daniels. In addition, it was found that there is no effect on the rate of the thermal oxidation due to either (a) addition of several olefins or (b) photolysis of the product NO2. (Author abstract)##

02851

E. R. Stephens

THE ROLE OF OXYGEN ATOMS IN THE ATMOSPHERIC REACTION OF OLEFINS WITH NITRIC OXIDE. Intern. J. Air Water Pollution 10, (11-12) 793-803, Dec. 1966.

The photoconversion of nitric oxide to nitrogen dioxide in the presence of olefin at low concentrations in air was studied with two objectives: (1) to test the hypothesis that oxygen atoms are the principal reagents attacking the olefin in the absence of ozone; and (2) to determine the average number of nitrogen dioxide molecules formed for each molecule of olefin consumed to see whether the conversion has the aspects of a chain reaction. On the basis of the O-atomshypothesis it is predicted that the rate of oxidation of a given olefin should be proportional to the produce of the light intensity and the nitrogen dioxide concentration. It should not be affected by the addition of a second olefin. This was found to be nearly true for a wide variety of reaction conditions. About one to two nitrogen dioxide dioxide molecules were formed for each molecule of propene oxidized.##

02853

Y. Masuda, M. Kuratsune

PHOTOCHEMICAL OXIDATION OF BENZO(A)PYRENE. Intern. J. Air Water Pollution (Presented at the 23rd Annual Meeting, Japanese Cancer Association, Tokyo, Japan, Nov. 11, 1964.) 10 (11-12):805-11, Dec. 1966.

Benzo(a)pyrene dissolved in benzene was irradiated by UV light of wave length greater than 280 millicrons. Oxygen was present in the benzene. The irradiation product was fractionated by alumina column chromatography, isolating three crystalline compounds. These compounds were determined as 6,12-benzo(a)pyrenequinone, 1, 6-benzo(a)pyrenequinone and 3,6-benzo(a)-pyrenequinone by their melting points, data of elementary analysis, and IR as well as UV absorption spectra. AA##

02899

J. F. van der Wal

CONCENTRATING DILUTE AEROSOLS BY ELECTROSTATIC METHODS. National Defence Research Organization TNO, Rijswijk, Netherlands, Chemical Lab. (Rept. 1966-12.) 20 pp., June 1966.
DDC AD 488229

A first attempt was made to develop a method by which aerosols can be concentrated, using electrostatic principles. Plastics were given an electrostatic charge by sudden removal of the plastic from a high voltage source. The aerosol was precipitated on the charged plastic. The concentration of the precipitated aerosol was determined with an electron-microscope. The reproducibility of this tentative method is reasonably good, compared with methods based on other electrostatic phenomena. In the present stage, the method is insufficiently sensitive; this might be improved by optimalization of the experimental conditions. (Author summary)##

02904

A. Goetz

METHODS FOR MEASURING PARTICLE COMPOSITION IN PHOTO-ACTIVATED AEROSOLS. J. Air Pollution Control Assoc. 14, (6) 213-9, June 1964, (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

Author discusses the basic processes and mechanisms which cause the photochemical formation of aerosols, that is which effect the conversion of certain atmospheric constituents from the gaseous into the aerocolloidal state. Author demonstrates that it is

possible to study the formation and decay of such aerocolloidal systems in considerable detail, particularly as to the quantitative relationships between the photochemical partners.##

03009

P. de Mayo

THE PHOTOCHEMISTRY OF UNSATURATE SYSTEMS CONTAINING HETERO ATOMS OTHER THAN OXYGEN (FINAL REPT. SEPT. 1965-MAY 1966). Western Ontario Univ., London, Canada, Dept. of Chemistry. 6 pp., 1966

This report presents a summary of a study of the products and mechanisms of reactions wherein unsaturated systems containing nitrogen or sulfur are photolyzed. Included are studies of (1) the photochemical Beckmann rearrangement, (2) the general heteroatom transfer, (3) coumalin dimerization, and (4) the photolytic decomposition of B-ketosulphones.##

03016

J. R. Kelso

THE PRODUCTION OF ATOMIC OXYGEN BY THE THERMAL DECOMPOSITION OF OZONE. Ballistic Research Labs., Aberdeen Proving Ground, Md., Interior Ballistics Lab. (BRL Rept. No. 1323) 24 pp., June 1966

To study the reactions of atomic oxygen it is desirabe to have a supply that is free of metastable energetic species of molecular and atomic oxygen which are formed in discharged oxygen and because fo their side reactions can lead to serious errors in calculations. Therefore, the homogenous, thermal, gas phase decomposition of dry ozone was tried and found to be a satisfactory source if the residence time of ozone in the furnace is carefully regulated by furnace length and carrier gas flow, followed by rapid cooling of the products of decomposition. (Author abstract)##

03020

E. Miescher

ANALYSIS OF THE SPECTRUM OF THE NITRIC OXIDE MOLECULE (FINAL SCIENTIFIC REPT.). Basel Univ., Switzerland, Inst. of Physics. (Rept. No. AFCRL-66-440) 7 pp. Mar. 31, 1966.

The experimental studies of the spectrum of the NO molecule are reviewed. A short description of the observed 3 delta states and of Rydberg-complexes is given. Problems left for future work on the NO spectrum are discussed.##

03066

D. Durant and G. R. McMillan.

ENERGY DISTRIBUTION OF PHOTOCHEMICALLY GENERATED T-PENTOXY RADICALS. J. Phys. Chem. 70 (9) 2709-13, Sept. 1966.

Previous studies on excited alkoxy radicals formed in photochemical processes were extended to the t-pentoxy species, which is well known to decompose by two parallel paths. The ratio of rate constants k sub 1/k sub 2 was estimated to be 104 at 114 degrees from experiments on pyrolysis of t-pentyl nitrite. For radicals formed by photolysis of this compound, k sub 1/k sub 2 depends strongly on the absorbed wavelength but does not reach the expected limiting value of 104 at the longest wavelength which could be studied. The dependence of quantum yields at 3660 A on pressure of an added scavenger, nitric oxide, showed that the k sub 1/k sub 2 obtained from photochemical experiments could be accounted for quantitatively by a contribution from excited radicals and a contribution identical with the ratio for unexcited radicals, obtained from pyrolysis experiments. These results provide limited justification for the "alpha method" often used in kinetic treatment of excited radical effects. Quantum-yeild measurements at high pressures of added nitric oxide suggest preferential removal of excited radicals of lower energy and disclose a broad energy distribution of the excited radicals. (Author abstract)##

03107

R.W. Boubel L.A. Ripperton

OXIDES OF NITROGEN AND UNBURNED HYDROCARBONS PRODUCED DURING CONTROLLED COMBUSTION. J. Air Pollution Control Assoc. 15, (6) 270-3, June 1965.

A diffusion flame burner was operated to determine the effect of several parameters on the quantity of NOx and unburned hydrocarbons produced. The statistical analysis indicated the unburned hydrocarbon emissions to be dependent upon the rate of heat release in the system, the amount of excess combustion air, the fuel molecular structure, and the interaction between the fuel structure, and the amount of excess air. The NOx emissions reached a maximum at the conditions which yielded minimum unburned hydrocarbon emissions. Multiple regressions were made which yielded predicting equations for both the unburned hydrocarbon and the NOx for the apparatus used. (Author abstract)##

03114

W.A. Glasson C.S. Tuesday

HYDROCARBON REACTIVITY AND THE KINETICS OF THE ATMOSPHERIC PHOTOOXIDATION OF NITRIC OXIDE. General Motors Corp.,

Warren, Mich., Fuels and Lubricants Dept. (Research Publication GMR-586) Aug. 15, 1966. 23 pp. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966.)

The reactivity in the atmospheric photooxidation of NO has recently been determined for a large number of hydrocarbons. To aid in the application of these hydrocarbon reactivity measurements, the kinetics of the atmospheric photooxidation were studied. The hydrocarbon investigated covered a wide range of reactivities and structures and included: 2,3-dimethyl-2-butene, 2-methyl-2-butene, 2-methyl-1-pentene, propylene, mesitylene, and n-hexane. The rate of NO photooxidation increases less than linearly with hydrocarbon concentration for all the hydrocarbons studied. The degree of non-linearity, however, varied with hydrocarbon structure and reactivity. The effect of the NC and the NO2 concentrations on the rate of NC photooxidation also depended somewhat on hydrocarbon structure and reactivity. For all of the hydrocarbons studied, however, the NO photooxidation rate increased linearly with increased light intensity. The effect of complex hydrocarbon mixtures on the rate NO photooxidation was investigated using 3 commercial gasolines. The NO photooxidation rates measured for these mixtures agreed within experimental error with calculated rates based on chromatographic analyses of the gasolines and the reactivity in NO) photooxidation of the individual hydrocarbons in the gasolines. (Author abstract) ##

03149

S. A. Clough and F. X. Kenizys

CORIOLIS INTERACTION IN THE NU1 AND NU3 FUNDAMENTALS OF OZONE. J. CHEM. PHYS. 44, (2) 1855-61, MAR. 1, 1966. CFSTI, DDC AD 638825

The nu sub 1 and nu sub 2 vibration rotation spectrum of ozone in the 9.0 micron region was analyzed. The 2 vibration states are coupled through a Coriolis term, iY sub 13P sub y, and a second-order distortion term, -X sub 13 (PsubxPsubz plus PsubxPsubzPsubx), in the Hamiltonian. The interaction was treated by numerically diagonalizing the secular determinant for the 2 states with the coupling included. The effect of the interaction of the intensities was considered and absorption contours calculated in satisfactory agreement with experiment. With the distortion parameters fixed to the groundstate values, the constants were obtained.##

03150

CATALYTIC COMBUSTION OF CARBON MONOXIDE ON COPPER OXIDE (EFFECT OF WATER VAPOR). Ind. Eng. Chem. Process Design Develop. 5 (3) 214-7, July 1966.

The effect of water vapor on the catalytic combustion of carbon monoxide on copper oxide was investigated. The water vapor content in the carrier gas stream was varied from 0 to 3000 ppm with the total gas flow maintained constant at 400 hr (NTP) at temperatures ranging from 70 to 130 C. The initial concentration of carbon monoxide was varied from 500 to 1500 ppm. The reaction was first order for water vapor concentrations of 800 ppm. and above and 0.4 order in the absence of water vapor. The combustion rate of carbon monoxide was strongly affected by small changes in water vapor concentrations when the total water vapor content was less than 800 ppm. (Author abstract)##

03160

K. Kimura O. Tada, K. Kumotsuki, and K. Nakaaki

ON THE GENERATION OF SULFURIC ACID MIST FROM SULFUR DIOXIDE IN THE ATMOSPHERIC AIR. J. Sci. Labour 41, (10) 510-11, Oct. 1965.

Experimental studies are reported on the simulated oxidation of sulfur dioxide in atmospheric air. It was observed that the higher the air current velocity, and the higher the relative humidity, the more marked the decrease of SO2 concentration. Sulfuric acid studies showed that it is produced by oxidation of SO2 in the air and that the coexistence of NO2, O3 or H2O2 enhances the production of H_2SO_4. Microscope studies of the sulfuric acid mist formed by SO2 oxidation revealed that the presence of particulate matter contributes to the formation of the acid mist. Electron microscope studies substantiated experimental results by showing that samples of city air contained particles similar to sulfuric acid mist particles obtained experimentally.##

C3177

H. Sjogren.

FORMATION OF CARBON DIOXIDE IONS AFTER ELECTRON AND ION IMPACT. Royal Inst. of Tech., Sweden, Dept. of Physics. March 15, 1966. 18 pp.

The ionization of CO2 was investigated in a double mass spectrometer, and the breakdown graph was constructed. The appearance potential of O plus formed in dissociative charge transfer is shown to be 22.4 eV, while the electron impact value is 19.5 eV. The discrepancy is explained according to Wigner-Witmer correlation rules. A break in the electron impact ionization efficiency curve is explained as being due to charge exchange between CO plus ions, formed in the dissociative charge transfer, and CO2. (Author abstract)##

03179

L. Spialter and J. D. Austin.

THE CLEAVAGE OF SILANES BY OXIDES OF NITROGEN. J. Am. Chem. SOC. 88, 1828, 1966.
CPSTI, DDC AD 638836

The cleavage of silanes by oxides of nitrogen is reported. Triethylsilane reacts exothermally with NO2 to yield triethylsilanol and hexaethyldisiloxane. In a separate experiment, under similar conditions, triethylsilanol readily gave the dehydration product, hexaethyldisiloxane. The silicon-silicon bond in hexamethyldisilane is also cleanly cleaved by No 2 to hexamethyldisiloxane in 95% yield. Rupture of the silicon-alkyl bond was observed when tetraethylsilane was allowed to react with NO2. The principal products obtained were hexaethyldisiloxane and acetic acid. Under similar conditions, hexaethyldisiloxane yielded hexaethylcyclotrisiloxane, octaethylcyclotetrasiloxane, and octaethyltrisiloxane. The silicon-aryl bond was also cleaved in trimethylphenylsilane by NO 2 to produce hexamethyldisiloxane and nitrobenzene. When all of the phenyl group had been removed from silicon, the vapor phase chromatogram of the crude reaction product did not show the presence of any polysiloxane components other than the disiloxane. The rate of cleavage of an ethyl group from hexaethyldisiloxane by NO2 was slow compared to that from tetraethylsilane. However, all other cleavage reactions proceeded readily and with exothermicity at room temperature to give reaction products in good (90%) yields. NOo cleaved triethylsilane to triethylsilanol at room temperature. NO also produced the silanol with complete reaction in less than 6 hr, whereas N2O gave only 10% conversion after 6 hr. It appears that the oxides of nitrogen behave similarly toward organosilanes, but with differeing degrees of activity, i.e., in decreasing order of reactivity, NOx, NO3, NO, and much slower N2O. ##

03184

A. Y. Ung and H. I. Schiff.

THE PHOTOLYSIS OF CO2 AT 47C A. Can. J. Chem. 44, 1981-91, 1966.

The apparatus used to study the photolysis contained a collimating region which minimized the effect of divergent light, and permitted the temperature of the cell and lamp to be controlled separately. Analytical sensitivity was such that conversions less than 0.2% were possible. Although CO and O2 were the only stable products, the CO/O2 ratios were higher than those required by mass balance. The product yields were found to be independent of CO2 pressure and to be linear with irradiation time at 25 C. At higher temperatures the quantum yields decreased and at 200 C were no longer linear functions of

irradiation time. The O2 yields decreased when CO was added, the effect increasing with temperature. The overall quantum yield was less than unity. Reactions were observed with CH4, H2, and N2O when these were added in small amount. These results indicated the presence of a reactive species, capable of promoting back reactions and of being adsorbed on the walls. A mechanism is suggested which best fits the results and which postulates CO3 as the reactive species. (Author abstract)##

03186

G. Wettermark.

HIGH INTENSITY PHOTOLYSIS STUDIES OF ACETONE AND SOME ALIPHATIC ALDEHYDES. Arkiv Kemi 18, (1) 79, Apr. 12, 1961.
CFSTI, DDC AD 639939

The vapor phase photolyses of acetone, acetaldehyde, propionaldehyde, n-butyraldehyde and isobutyraldehyde were investigated at very high light intensities. High intensity flash light sources were used. Analyses for all major products were made on samples which were exposed to unfiltered light in a cylindrical reaction vessel. In the present case 1800 joules were discharged in this apparatus, giving absorbed intensities of the order of 10 to the 25th power quanta/sec/liter with a flash period of 10 microsec. The stoichiometry of the products showed that all important constituents were measured. By using a very intense point-discharge, quantum yields for the formation of the main products were determined in parallel light. The samples absorbed light in the absorption band around 280 microsec. Flashes of 100,000 joules, which gave absorbed intensities of the order of 10 to the 29th power quanta/sec/litre were used throughout. The absorbed light dose was calculated from a knowledge of the various quantities involved. Thus the spectral distribution of the light emitted from the discharge was determined. In all cases the samples were subjected to one single flash. The product yields were determined by gas chromatography using a flame ionization detector or a high sensitivity thermal conductivity detector. Helium was added in some experiments in order to determine the influence of the reaction temperature on the product yields. It was found that reactions which are first order with respect to radical concentration could be satisfactorily eliminated. This resulted in a striking simplification of the reaction schemes and has led to new information concerning the primary photochemical mechanisms and the reactions of the formed radicals.##

03343

HYDROCARBON - AIR FUEL CELLS (SEMI-ANNUAL TECHNICAL SUMMARY REPORT NO. 9, JAN. 1 - JUNE 30, 1966). General Electric Co., Lynn, Mass. (Order No. 247). 1966. 238 pp.
CFSTI, DDC 640 521

Electrocatalyst Research: A portion of the research effort was

directed towards the understanding of the ccmplex processes occurring at hydrocarbon anodes. Surface species were identified as partially dehydrogenated radicals derived from fuel, cracking products and partially oxygenated species. Some are particularly refractory and contribute to limitations on performance. In all cases, the anodic performance is strongly influenced by the adsorption rate, the ability of the catalyst to promote cracking, and the reaction of C(1) radicals with water. Accumulation of the refractory species results in the lowering of maximum currents. For economic reasons, long term goals indicate the use of non-platinoid electrocatalysts in fuel cell electrodes. At present, work is being concentrated on more effective utilization of the noble metals, especially Pt, Pt-Ru, Pt-Ir, and ternary alloys of Pt, Ru and Au were evaluated as high area catalysts in thin porous electrodes, with 85% H3P04 electrolyte, and propane and octane fuels. None showed significant improvement over Pt used alone. Better results with these alloys were obtained with H2-CO fuel mixtures. Electrodes: Emphasis in this area is on the development of electrode structures which employ the catalysts developed from the above mentioned research. Basic electrode structure is the thin proous Niedrach-Alford types. Major effort was directed toward B4C supported catalysts. Multi-Component Fuels: Plans are to include research on mixtures of saturated hydrocarbons, olefins, aromatic hydrocarbons as well as the reference fuel of octane. Electrolytes: The principal electrolyte has been concentrated H3P04. HF was used as an alternate electrolyte and did not show the same tendency to cycle as the H3P04 electrolyte.##

03349

I. C. Hisatsune.

STRUCTURES OF SOME OXIDES OF NITROGEN (SUMMARY PROGRESS REPT. OCT. 27, 1965 - DEC. 31, 1966). Preprint. Dec. 31, 1966.

The kinetic study of the third order reaction between NO and O2 was completed. Partial pressures of NO and O2 were varied from one to 200 mm and one to 470 mm respectively, and mole ratios of these reactants were chosen so that the final partial pressures of the reaction product NO2 were between one and 14 mm. Nitrogen gas was used as diluent in order to maintain essentially a constant total pressure (near 480 mm) during the reaction. The reaction was followed by recording the changes in the absorption intensity of the 1640 cm-1 NO2 IR fundamental band. Kinetic runs were made with one reactant in excess, and the resulting experimental data gave pseudo first or second order rate plots which were linear over 80 to 90 percent of the reaction. The temperature dependence of the rate constants was studied between 4 and 55 C. In this case, both the reaction cell and the reactant storage bulbs were maintained at constant temperature. From the tabulated experimental data a rate constant for this third order reaction was obtained: $k = (6.18 \pm 0.20) \times 10^3 \exp((+0.50 \pm 0.40 \text{ kcal/mole})/RT)$ liter 2 / mole 2 -sec where the estimated uncertainties are maximum errors. Kinetic studies on the NO-C12 and NO-Br2 systems were initiated. In the case of the chloride system, the reaction was found to be influenced by fluorescent light but not by the IR light source. Tentative

values of the rate constant at 22.7 C were found to be 19.6 + or - 0.7 and (7.92 + or - 0.42) x 1000 liter 2/mole 2 - sec respectively for the chloride and the bromide.##

03356

A. H. Taylor

OZONE PREPARATION AND STABILITY IN HIGH CONCENTRATIONS (VOLUME 2 BIBLIOGRAPHY) (FINAL REPT.). Air Reduction Sales Co., Murray Hill, N.J., Dept. of Research and Engineering. Sept. 22, 1949. 234 pp.
CFSTI, DDC 639200

The literature references and abstracts which are assembled in this bibliography have been located through formal searches of abstract journals listed in the appropriate Table below, and in general are limited (a) to those appearing during the last third of the century of active interest in ozone, and (b) to selected topics of immediate application. It was apparent at the outset that much of the early work would either be superseded by more accurate observations or be quoted by later workers. It was also expected that if use should indicate the advisability of so doing, additional material could be added at will to a bibliography which was flexible in arrangement. In its present state of development (Sept. 22, 1949) the ozone bibliography represents a careful formal search of the Chemical Abstracts Indexes from 1917 through 1948 plus searches in the individual numbers which have appeared thus far in 1949. Since insufficient information on the toxicity of ozone was available solely from Chemical Abstracts, additional searches back to 1910 were made in the various medical abstract journals. In the course of the above efforts and by legacy from previous searches, a number of earlier and pertinent references have been obtained and are included. (Author introduction modified)##

03361

B. H. Sage

FORMATION OF OXIDES OF NITROGEN DURING COMBUSTION AT ATMOSPHERIC PRESSURE. Preprint. 1966.

Experimental measurements were made of the perturbations in monochromatic and total optical intensity. Supplemental measurements of the perturbations in normal stress were made. All of the measurements were carried out at a natural gas mixture ratio of approximately 0.88 stoichiometric. The composition of the products of reaction is set forth. The mole fraction of oxides of nitrogen as well as the principal components including carbon dioxide, oxygen and carbon monoxide are included. A significant variation exists in the perturbations in normal stress and in monochromatic intensity with respect to time. The perturbations in monochromatic intensity seem to undergo more variation than do the perturbations in normal stress. For the most part the frequency of the perturbations in normal stress and

in monochromatic intensity, corresponding to the wavelengths of carbon dioxide and water, is substantially equal. A limited number of measurements were made in the upper part of the combustor with regard to the perturbations in optical intensity. The relative magnitude was comparable to the perturbations encountered near the flameholder. Comparisons are presented of the perturbations in normal stress and the perturbations in monochromatic intensity corresponding to the emission of carbon dioxide at two different time scales. The variations in the stability of the two types of perturbations are markedly different. The frequencies of these perturbations are closely allied and appear to offer credence to the assumption that they are directly related. A similar comparison is made for the perturbations in monochromatic intensity of the wavelength corresponding to the emission of water. Again, the irregularities of the fluctuations in the nature of the perturbations in monochromatic intensity, as compared to the relatively regular perturbations in normal stress, are evident.##

03428

C. S. Tuesday.

THE ATMOSPHERIC PHOTOOXIDATION OF OLEFINS: THE EFFECT OF NITROGEN OXIDES. General Motors Research Labs, Warren, Mich., 1961, 25 pp. (Presented at the Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5-7, 1961.) (Rept. No. GMR-355.)

The role of the oxides of nitrogen in the atmospheric photooxidation of olefins was further investigated. A previous study from this laboratory indicated, among other things, that the photooxidation of trans-2-butene was both promoted and inhibited by nitric oxide depending upon the concentration. To explain and extend this observation, the effects of various concentrations of NO2 and NO on the photooxidation rates of propylene, isobutene, trans-2-butene, and 2,3 dimethyl-2-butene were determined together with the effects of NO concentration on reaction products. The olefins investigated differed not only in photooxidation rate for a particular NO2 concentration but also in the dependence of this rate on the initial concentration of NO2. Initial increases in NO2 concentration increased the photooxidation rate of all the olefins studied. When the initial NO2 concentration was increased further each olefin behaved differently. The photooxidation rates of trans-2-butene and tetramethylethylene increased with increasing concentrations of NO up to a maximum rate. Further increases in the initial concentration of NO reduced the photooxidation rate of both these olefins. Further increases in NO concentration inhibit the olefin photooxidation rate by decreasing the concentration of ozone and the rate of the ozone-olefin reaction. The decreased rate of ozone plus olefin reaction also decreases the rate and amount of compound X formation since compound X is apparently formed by further reactions of some of the products of the ozone plus olefin reaction. The role of the oxides of nitrogen in the atmospheric photooxidation of olefins is quite complex. NO promotes or inhibits olefin photooxidation depending upon the ratio of reactants. NO2 promotes or inhibits olefin photooxidation

depending both on the relative concentration of reactants and the nature of the olefin.##

03446

B. H. Croom and E. W. Leyhe.

THERMODYNAMIC, TRANSPORT, AND FLOW PROPERTIES FOR THE PRODUCTS OF METHANE BURNED IN OXYGEN-ENRICHED AIR. National Aeronautics and space administration, Langley Station Hampton, Va., Langley Research Center. (Rept. No. NASA SP-3035.) 1966. 90 PP.
CFSTI, NASA: SP-3035

In testing materials for resistance to extremely high-temperature oxidizing environments, large-scale hypersonic test facilities for simulating flight environments to which some of these materials may be exposed are used. Combustion heating of a high-pressure airstream is one of the approaches used in this simulation. It is sometimes desirable to maintain burning in a test gas in order to determine the effect of oxidation on materials in the test gas. As combustion-product oxygen percentages approaching those in air (20% by vol) are required, the need for data on the properties of a combustion-heated, oxygen-enriched test medium is obvious. The present paper presents results of the data obtained on the properties of methane burned with oxygen-enriched air. These include calculations to determine the composition and the thermodynamic, transport, and flow properties (including normal-shock properties) of gas mixtures. These properties are computed for methane burned in air enriched with oxygen so as to maintain approximately 20% oxygen in the combustion products. Results are presented for equivalence ratios of 0.315, 0.380, 0.425, 0.480, and 0.525, for pressures varying from 0.0001 to 1000 atmospheres and for temperatures from 100 R (56K) to 6000 R (3300K). (Author summary)##

03484

R. Gorden, Jr. and P. Ausloos

VAPOR-PHASE PHOTOLYSIS OF FORMIC ACID. J. Phys. Chem. 65, 1033-7, June 1961.

The direct photolysis and the photosensitized decomposition of HCOOH and DCOOH were investigated in the presence and absence of radical scavengers. The results indicate, in contrast to those of earlier investigations, that besides reactions I and II which involve intramolecular rearrangements HCOOH plus hv equals H2O plus CO (I) and HCOOH plus hv equals H2 plus CO2 (II) radical-producing primary processes must be considered as well. It will be shown that process HCOOH plus hv equals HCO plus OH is the most important source of free radicals in the direct photolysis of formic acid. The effect of temperature on the rate

of formation of the products was investigated in some detail. Above 200 degrees three different chain processes were found to occur: (a) H plus HCOOH equals H2O plus HCO, HCO equals H plus CO; (b) H plus HCOOH equals H2 plus COOH, COOH equals CO2 plus H; (c) H plus HCOOH equals HCOO plus H2, HcOO equals H plus CO2. (Author abstract)##

03488

J. Heicklen and H. S. Johnston

PHOTOCHEMICAL OXIDATIONS. I. ETHYL IODIDE. J. Am. Chem. Soc. 84, 4394-4403, Dec. 5, 1962.

The room temperature (25 plus or minus 2 degrees) photo-oxidation of ethyl iodide (0.06 to 2.8 mm.) in oxygen (2.8 mm.) with continuous radiation (usually above 2200 A.) was studied by irradiation in a cylindrical volume with a pinhole leak directly into a Bendix model 14 time-of-flight mass spectrometer. The initial products observed are C2H5OH, CH3CHO, and I2 in large amounts and C2H5OOC2H5, C2H5OOH, and C2H5OI in small amounts. Because of the cracking pattern of the reactants, it was impossible to establish the presence or absence of CH4, C2H2, C2H4, C2H6, HCHO2, CO2 and HI. From mass balance HI was inferred to be a minor initial product. A fairly satisfactory nine-step mechanism can be found for the initial rate data, and several ratios of rate constants were evaluated from the data. The reaction was studied to about 3% completion, at which point diffusion of products through the pin-hole balanced the rate of photochemical production. The rate of attainment of this steady state and the steady-state pressures gave additional information beyond that found for the initial rates. The reaction at a few percent conversion of ethyl iodide is much more complex that the initial reaction; there is secondary production of alcohol, strong secondary destruction (perhaps largely heterogeneous) of C2H5OOH and C2H5OI, and slight over-all inhibition by I2. Water was observed as a secondary product, coming in after a pronounced induction period. Even with a 14-step mechanism, all features of the reaction at 3% completion could not be explained. Although considerable effort was directed toward finding ozone in this system, it was never present in an amount as great as 10 to the minus 8th power. (Author abstract)##

03493

G. E. McGraw, D. L. Bernitt, and I. C. Hisatune

INFRARED SPECTRA OF ISOTOPIC HYPONITRITE IONS. Spectrochim. Acta 23A, 25-34, 1967.

The infrared spectra of hyponitrite ions containing nitrogen-14 and/or nitrogen-15 have been obtained by the KBr disc and Nujol mull techniques. One infrared fundamental assigned by earlier

workers to this ion was found to belong to water, but a new fundamental was observed beyond the spectral range studied previously. Frequencies of the fundamentals have been assigned and confirmed by normal coordinate analysis. Some infrared data on isotopic hyponitrous acids have also been obtained. The acid appears to have a C(2h) symmetry in the solid state. (Author abstract) ##

03522L

R. C. Cookson

ASYMMETRIC ELECTRONIC TRANSITIONS AND PHOTOCHEMISTRY. (Final Technical Status Report). Southampton Univ., England, Dept. of Chemistry. Nov. 1965. 14 pp.
DDC: AD 479 240

Sigma to sigma transitions of organic compounds have been observed for the first time in the region of 210 to 260 millimicrons. Delocalisation of the sigma electron requires a chain of 4 atoms, the first and fourth having p orbitals parallel with the sigma bond joining the second and third. Examples are reported amongst unsaturated ketones, unsaturated amines and amino-ketones. The circular dichroism of 3 alpha- and 3 beta-phenyl-2,2 - ethylenedithic-cholestane and of some conjugated oximes is reported. The sign of rotation of the latter depends on the helicity of the chromophore in the same way as for alpha, beta unsaturated ketones. UV irradiation of hexamethylcyclohexane - 1,3,5-trione results in successive decarbonylation and beta-diketone - enol - lactone rearrangements. Photochemical isomerisation of four optically active camphenones involves intramolecular migration of the carbonyl group from one end to the other of the olefinic group, converting the bicyclo (2,2,1) heptenone into the bicyclo (3,2,0) heptenone system. The photoproducts show the high values of delta E characteristic of extensive mixing of n to pi and pi to pi transitions. (Author abstract) ##

03551

P. Ausloos and E. Murad.

THE FLUORESCENCE AND PHOSPHORESCENCE OF TRIFLUORACETONE VAPOR. J. Phys. Chem. 65, 1519-21, 1961.

The fluorescence and phosphorescene of trifluoroacetone has been investigated at 2652, 2804, 3025, 3130 and 3341 A. The effect of concentration and temperature on the yields of triplet and single-state emissions are comparable to those observed for acetone. The emissions from 2-butanone and 2-pentanone have been investigated briefly. Both compounds phosphoresce very weakly and their fluorescence yields are nearly identical with those observed for acetone and trifluoroacetone. (Author abstract) ##

03559

R. E. Rebbert and P. J. Ausloos.

COMPLICATING FACTORS IN THE GAS PHASE PHOTOLYSIS OF AZOMETHANE. J. Phys. Chem. 67, 1925-8, 1963.

In a recent publication of the gas phase photolysis of azomethane, Toby and Weiss suggested a new ethane-producing reaction: 2CH3N2 yields C2H6 plus 2N2 (a). On the other side, Rebbert and Ausloos presented evidence for the formation of ethane by a unimolecular elimination from azomethane CH3N2CH3 plus hv yields C2H6 plus N2 (b). The present study was undertaken in order to determine if the pressure trends observed by Toby and Weiss could not at least be partly accounted for by the occurrence of primary process (b). It is thought that an answer to this question, as well as to other related problems, could be most readily obtained by photolyzing equimolar mixtures of CH3N2CH3-CD3N2CD3. It was concluded that reaction (a), which has been proposed by Toby and Weiss to account for the observed pressure effect, has not been clearly established.##

03560

R. E. Rebbert and P. Ausloos.

INTRAMOLECULAR REARRANGEMENTS IN THE SOLID PHASE PHOTOLYSIS OF 4-METHYL-2-HEXANONE AND SEC-BUTYL ACETATE. J. Chem. Phys. 37, (5) 1158-9, Sept. 1, 1952.

The photolysis of 4-methyl-2-hexanone and of sec-butyl acetate was investigated in the solid phase at 77 and 4K. The high percentage of 1-butene and the relatively high values for the ratios cis-2-butene/trans-2-butene was explained by a hindered rotation along the C-C axis between the alpha and beta atoms and the beta and gamma carbon atoms, respectively.##

03561

R. E. Rebbert.

PRIMARY PROCESSES IN THE PHOTOLYSIS OF ETHYL NITRATE. J. Phys. Chem. 67, 1923-5, Sept. 1963.

Photolysis of ethyl nitrate was conducted mainly at room temperature and at 3130 A. with conversions of approximately 0.25%. The main products for the gas phase photolysis at low conversions were ethyl nitrite, acetaldehyde, nitrogen dioxide, and oxygen. Methyl nitrite, carbon monoxide, hydrogen, nitric oxide, and carbon dioxide were minor products. No attempt was made to detect or analyze nitromethane, formaldehyde, or nitrous oxide. The peak due to nitromethane would be lost on the chromatograph in the excess ethyl nitrate peak. Nitrogen was produced but the results were not consistent. The rates of formation of methyl

nitrite are not accurate and shcuild be regarded as relative rates, only. The quantum yields of ethyl nitrite and acetaldehyde formation extrapolated tc zero tine are 0.139 and 0.094, respectively. In the liquid phase at 0 degrees, oxygen is no longer a product. Ethyl nitrite and acetaldehyde are still the main products with small amounts of methyl nitrite. The distribution of products at low conversions is: acetaldehyde, 53.6%; ethyl nitrite, 46.0%; and methyl nitrite, 0.4%.##

03563

K. T. Whitby, D. A. Lundgren, and R. C. Jordan.

HOMOGENEOUS AEROSOL GENERATORS. Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering. (Technical Rept. No. 13.) Jan. 1961. 53 pp.

Two aerosol generators capable of generating essentially homogeneous, monodisperse, spherical, and electrically neutral solid particles of dye have been developed. These are an atomizer-impactor combination theoretically capable of generating particles ranging in mass median size from 0.02 to 0.5 microns, and a spinning disk generator capable of generating particles from about 0.5 to 20 microns in size. Research during the development of these generators has shown that under many conditions of operation the particles produced are electrically charged to a substantial fraction of the maximum equilibrium charge. This charge is neutralized by a unique ion genrator which reduces the charge to a few percent of the maximum. The generators were developed using methylene blue in water or in ethyl alcohol. However, due to the many advantages of fluorescent aerosols, an effort is being made to adapt the geneators to make satisfactory fluorescent particles. Satisfactory particles are now being generated from a mixture of methylene blue and comeercial enerated from a mixture of methylene blue a commercial uranine dissolved in alcohol. The sensitivity of modern fluorescent measuring techniques is great enough so that these aerosol genrators may be used to accurately evaluate gas cleaners at airflows of several thousand cubic feet per minute and efficiencies of 99.9% or greater. (Author summary)##

03575

R. R. Austin, R. W. Lewis, and R. Donaldson, Jr.

A NEW ATMCSPHERE IRRADIATION CHAMBER. Intern. J. Air Water Pollution 4, (304) 237-46, 1961.

The irradiation of atmospheric samples of air with ultraviolet light produces oxidants when hydrocarbons and nitrogen dioxide are present and thus permits a measurement of the smog-forming potential of the air. A new high irradiation intensity chamber using flucrescent ultraviolet lamps has been developed. Data are given for the irradiation of some hydrocarbons in air in the

presence of nitrogen dioxide. Some data are also given for atmospheric samples. The performance of the new chamber is compared to that of the fifty-liter chambers which have been in use in the past. The chamber volume is eight liters. Power required has been reduced from 1600 watts in the fifty-liter chamber to 160 watts. Oxidant levels produced at the same sampling rate on atmospheric samples are approximately equivalent to the levels produced in the fifty-liter chamber. (Author abstract) ##

03624

S. S. Thomas J. G. Calvert

THE PHOTOOXIDATION OF 2,2'-AZOISOBUTANE AT 25 C. J. Am. Chem Soc. 84, 4207-12, Nov. 20, 1962.

A rate of the photooxidation of 2,2'-azoisobutane has been made in an oxygen-rich atmosphere at 25 degrees. Long-path infrared spectrophotometry was used to identify the major products of the tert-butyl free radical-oxygen reaction as acetone, formaldehyde, tert-butyl hydroperoxide and tert-butyl alcohol; methanol and carbon dioxide were minor products. Reasonably good mass balances were obtained. From a consideration of the initial rates of product formation and azoisobutane disappearance, a detailed mechanism was proposed. The results suggested that for this oxygen-rich system at 25 degrees the radical-radical disproportionation reactions are the origin of hydroperoxide and alcohol products, and that H-abstraction from azoisobutane, formaldehyde or other H-containing products in the system was unimportant here. The rate data are consistent with a value of about 5 sec. for the first-order rate constant for the decomposition of the tert-butoxyl radical at 25 degrees. (Author abstract) ##

03682

A. P. Altshuller and A. F. Wartburg

ULTRAVIOLET DETERMINATION OF NITROGEN DIOXIDE AS NITRITE ION. Anal, Chem. 32, (2) 174-177, Feb. 1960.

A method for determining nitrogen dioxide concentrations in the 0.01 weight % range and above uses ultraviolet absorption at 355 millimicrons of the nitrite ion formed when nitrogen dioxide is absorbed in aqueous alkaline solutions of potassium or sodium hydroxide. The absorption maximum of nitrite ion at 211 millimicrons with an absorptivity of 5800 mole millimicrons liter cm. offers possibilities for determining nitrogen dioxide concentrations in the parts per million range. A synthetic mixture of nitrogen dioxide in nitrogen, in a gas cylinder, was analyzed by both ultraviolet analysis and a gravimetric procedure involving absorption of nitrogen dioxide in aqueous potassium hydroxide solution in a series of bubblers. Grab samples were absorbed in alkaline solution, and then analyzed by ultraviolet analysis. The results of the ultraviolet analyses by both methods of collection were in good agreement, giving a nitrogen dioxide concentration of 3.4 weight %. The gravimetric procedure gave somewhat lower results. (Author abstract) ##

038071

THE CHLORINE OXIDATION OF SULFUR COMPOUNDS IN DILUTE AQUEOUS SOLUTION. National Council for Stream Improvement, Inc., New York City. (Atmospheric Pollution Technical Bulleting 18.) June 1963. 16 pp.

Oxidation of sulfide in aqueous solution requires between 2 and 3.4 moles of Cl2 per mole of sulfide, depending upon conditions and the fraction of the sulfide oxidized. Oxidation of all the sulfide present requires at least 2.35 moles of Cl2 per mole of sulfide. Sulfate is a major product. Complete oxidation of methyl mercaptan in neutral or acid solutions requires between 2.4 and 3.3 moles of Cl2 per mole of mercaptan. Under basic conditions, methyl mercaptan apparently reacts to form an intermediate which, in turn, appears to oxidized by Cl2 once all the mercaptan has reacted. Formation of the suspected intermediate requires some 1.5 moles of Cl2 per mole of mercaptan, but a total of about 2.6 moles of Cl2 per mole of mercaptan must be added before the first trace of excess Cl2 can be detected. All attempts to identify the products of these reactions failed--probably because the concentrations involved were below the sensitivity limits of the tests used. Oxidation of dimethyl sulfide required 1.8 moles Cl2 per mole of sulfur. Oxidation of dimethyl disulfide required 5.2 moles of Cl2 per mole of disulfide--equivalent to 2.6 moles of Cl2 per mole of sulfur. All of the Cl2 oxidations were rapid enough to be complete before iodine was added. This means that the oxidations of inorganic sulfides and mercaptans required less than one minute and oxidation of the organic sulfides took less than five minutes.##

03968

Cadle, Richard D. and Margaret Ledford

THE REACTION OF OZONE WITH HYDROGEN SULFIDE. Intern. J. Air Water Pollution, 10(1):25-30, Jan. 1966. 7 refs.

The gas phase reaction of ozone with hydrogen sulfide in a mixture of oxygen and nitrogen serving as carrier gas has been investigated. The only products found were sulfur dioxide and water, and the stoichiometry corresponded approximately to the equation: H2S plus O3 yields H2O plus SO2. The reaction kinetics were investigated with a flow system, and a method was developed for titrating with nitric oxide the ozone remaining after reaction with hydrogen sulfide. The reaction has orders near zero and 1.5 in hydrogen sulfide and ozone respectively, and follows a given rate law. It is at least partially heterogeneous. The results can be used to set an upper limit for the rate of this reaction in the atmosphere. (Authors' abstract, modified)##

03969

J. G. Christian and J. E. Johnson

CATALYTIC COMBUSTION OF ATMOSPHERIC CONTAMINANTS OVER HOPCALITE. Intern. J. Air Water Pollution 9, (1/2) 1-10, Feb. 1965.

Catalytic combustion studies showed Hopcalite, an unsupported coprecipitate of copper and manganese oxides, to provide substantially complete oxidation at ca. 300 C of vapors of several types of hydrocarbons, oxygenated compounds, nitrogen compounds, and halogenated compounds. The lower molecular weight hydrocarbons proved resistant to oxidation; methane was oxidized only to the extent of 30 per cent even at 400 C. The organic nitrogen compounds produced the theoretical amount of CO2 as well as appreciable amounts of nitrous oxide (N2O). Ammonia produced 70% nitrous oxide at 315 C, and about 2% nitrogen dioxide (NO2). The decomposition of organic halogen compounds ranged from slight in the case of Freon-12 to virtually complete for methyl chloroform. In addition, new organic halides were formed by the oxidation of methyl chloroform and Freon-11. There is at least partial retention of halogen on the catalyst when Freon-114B2 and Freon-11 are decomposed. Aerosols of dioctylphthalate, a hydrocarbon-type lubricating oil, and a triarylphosphate ester lubricant were quantitatively oxidized by Hopcalite at 300 C. (Author abstract)##

03985

K. C. Salooja

STUDIES OF COMBUSTION PROCESSES LEADING TO IGNITION OF SOME OXYGEN DERIVATIVES OF HYDROCARBONS. Combust. Flame 10, (1) 11-21, March 1966.

The pre-flame and ignition behaviors of several related oxygen drivatives of hydrocarbons, acetic acid, methyl formate, methyl acetate, ethyl acetate, methyl propionate, propionic acid, ethyl formate, acetyl acetone, and acetic anhydride were investigated. Mechanisms proposed to explain observed differences are discussed in relation to: (1) a carbonyl group causes greater activation of adjacent alkyl groups than does an oxygen atom in an ether linkage; (2) peroxy radicals formed in the initial stages of oxidation can readily undergo 1,5 and 1,6 intramolecular transfer; (3) the oxygen atom in the carbonyl group tends to form hydrogen bonds intramolecularly. With acetic acid, the combustion process appeared more exothermic than of any hydrocarbons studied. Methyl formate ignited at a much lower temperature than acetic acid, with explosive violence; also greater amounts of methane and methanol were produced than by acetic acid at corresponding pre-flame stages: While CO2 is formed in greater amounts than CO from methyl formate, the reverse is true with methyl acetate. In comparison with methyl acetate, ethyl acetate began to oxidize at a slightly higher temperature but ignited at a considerably lower temperature with explosive violence. In comparison

with ethyl acetate, methyl propionate began to oxidize at a lower temperature but its extent of reaction increased less with temperature, and it eventually ignited at a higher temperature. Methyl propionate produced more CO2 th an CO until slightly below ignition temperature than ethyl acetate. Analysis of gaseous oxidation products of propionic acid and ethyl formate showed that acetaldehyde was formed in larger amounts from propionic acid and ethylene was formed in larter amounts from ethyl formate. Biacetyl trast to hydrocarbons oxidizing in the "low temperature" region, biacetyl oxidation in the low temperature region. Acetic anhydride was even more reactive than biacetyl and showed no zone of negative temperature coefficient. In its oxidative degradation, CO was formed in considerable amounts before any consumption of O2 could be detected.##

03986

B. A. Davies D. B. Scully

CARBON FORMATION FROM AROMATIC HYDROCARBONS II. Combust. FLAME 10, (2) 165-70, JUNE 1966.

Previous work on the yields of carbon black from aromatic hydrocarbons by injection of their vapours into the products of combustion of a rich towns gas-air premixed flame has been continued. Yields from toluidines are higher than from aniline. The yields from cresols are the same as from phenol. The addition of oxygen to benzene and toluene decrease the yields, which eventually become the same, indicating preferential oxidation of the side chain. The NO2 group in nitrobenzene does not alter the amount of soot formed relative to that from benzene. Acetylene forms soot much less readily than benzene. Cyclcpentadiene does not form soot, but indene does so readily. Styrene, ethylbenzene and naphthalene have also been studied. (Author summary)##

04155

V. D. Reshetov

AEROSOL ORIGIN OF ATMOSPHERIC OZONE (A HYPOTHESIS). U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol. 13. (Part I- Atmospheric ozone. Results of U.S.S.R. International Geophysical Year Studies Presented at the Oct. 28-31, 1959 Conference. Reports and Resolutions.) pp. 73-85. 1961. Russ. (Tr.)
CFSTI: TT 66 62191

The modern theory of photochemical atmospheric ozone origin fails to explain some facts and ozone properties. For instance, in the south, where ultraviolet radiation is greater the amount of ozone is smaller than in northern regions, where radiation arrival is considerably less, and during the polar night is nonexistent. It

also fails to explain annual changes in ozone content with a maximum at the end of winter and beginning of spring, and high ozone content in the lower portion of the stratosphere and troposphere, since that portion of ultraviolet radiation, which generates atomic oxygen, is absorbed totally above the 20-km level. It is also difficult to explain the appearance of special ozone maximum observed sometimes in the tropopause, or the considerable fluctuations in ozone content associated with weather conditions. It is conceivable that atmospheric ozone is also generated under the effect of other factors, which, in a number of cases, may be highly important. A hypothesis is presented on the generation of atmospheric ozone by atmospheric aerosols from water and atmospheric oxygen during selective sorption and desorption at the aerosol surface. (Author introduction modified)##

04171

O.. M.. Rozental

STRUCTURAL OZONE MOLECULE MODELS.. U.S.S.R.. Literature on Air Pollution and Related Occupational Diseases, B. S. Levine, Vol.. 13.. (Part II - Atmospheric Ozone.. Data Presented at the May 21-23, 1963 Conference on Atmospheric Ozone.) pp.. 225-9.. 1965.. Russ.. (Tr.)
CFSTI: TT 6662191

A clear concept of the ozone molecule structure might advance the solution of the atmospheric ozone problem.. Four configurations of atomic centers had been proposed in the past for the ozone molecule, each of a different symmetrical type.. The inconsistencies of each proposed model are brought out in this report and proof is offered in favor of an absolutely nonsymmetric model, the kind of which had not been considered before.. Proof of the acceptability of a nonsymmetric model amounts to a strictly numerical calculation procedure which involves 1) analysis of the infrared ozone spectrum, 2) study of the energy levels in the case of an assumed motion of the third atom, and 3) accurate determination of dynamic coefficients.##

04228L

P.. Goldfinger, G.. Huybrechts, and L.. Meyers

THE CHLORINE PHOTOSENSITIZED OXIDATION OF HYDROCARBONS AT LOW TEMPERATURE (FINAL TECHNICAL REPT..).. University Libre de Bruxelles, Belgium, Laboratoire de Chimie Physique.. Jan.. 1966.. 30 pp..

The study of the chlorine photosensitized oxidation of trichloroethylene has been completed.. A mechanism has been proposed for this reaction where dichloroacetyl chloride is the main reacton product and the rate constants of the relevant elementary reaction steps were estimated.. This together with preceding studies on the oxygen effect on the photochlorination of ethane and trichloroethylene has led to a reaction theory which seems to be of general validity.. In the second part of this

report a new reaction theory of chlorine photosensitized oxidation of hydrocarbons is presented which describes many of the kinetic investigations that have been carried out by the present work and reported in the literature. Due to the diversity of radicals in the reaction mechanism and the formation of different products not sufficiently unreactive, the reaction mechanism is not in final form and more experimental work is needed. (Author abstract)##

04277

N. Cohen and J. Heicklen

REACTION OF NO(A2SIGMA) WITH CO2. Aerospace Corp., El Segundo, Calif. (Rept Nos. SS-TR-66-155 and TR-669(6250-40)-16.) June 1966. 25 pp.

In the presence of CO2, NO(A2Sigma+) was produced by irradiation of NO-CO2 mixtures with a cadmium arc. The products monitored were N2, whose yield dropped as the (CO2)/(NO) ratio was enhanced, and CO, whose yield rose with the (CO2)/(NO) ratio to a constant upper limit. Product formation was unaffected by temperature changes (23 to 300 C) or by the addition of xenon or NO2. The results are explained by the simple competition NO(A2Sigma+)+ NO yields N2 + other products and NO(A2Sigma+)+ CO2 yeilds NO2 & CO. Carbon dioxide is about 3.4 times more efficient than NO in the competition. (Author abstract)##

04283

M. N. Hirsh, J. A. Slevin, G. M. Halpern, and N. Wolf

IONIZATION AND ELECTRON LOSS SIMULATION IN ATMOSPHERIC GASES (FINAL REPT.). Dewey (G.C.) and Co. Inc., New York City. (Technical Rept. ECOM-01354-F and Rept. R-199-3.). Sept. 1966. 247 pp.
DDC: AD 800398

Ionization and deionization processes in the upper atmosphere arising from prolonged irradiation by beta particles from trapped fission debris subsequent to the detonation of a nuclear device at high altitudes was physically simulated in the laboratory. The densities of free secondary electrons were deduced by resonant cavity methods. A mass spectrometer studied the positive and negative ions which diffused to the container walls. An optical spectrometer examined the light emitted by the fluorescing gas. Steady-state and afterglow measurements of electron densities, and steady-state mass and optical spectrometric studies, were made in O2, N2, and air-like 4:1 N2: O2 mixtures weakly ionized by a spatially uniform flux of 1.5 Mev electrons from a Van de Graaff accelerator. The plasma was contained in a reaction chamber which had been made very large to minimize wall-catalyzed chemical reactions and deexcitations; ultrahigh vacuum techniques safeguard gas purity.##

04285L

E. J. Poziomek

PHOTOCHEMISTRY OF HETEROCYCLIC COMPOUNDS (A LITERATURE SURVEY.)
Army Edgewood Arsenal, Md., Physical Research Lab.
(Rept. EASP 100-4.) Sept. 1966. 35 pp.
DDC: AD 488-239

The literature on the photochemistry of heterocyclic compounds was surveyed with a particular interest in pyridine chemistry. This listing of references was compiled as a result of searching volumes 41 to 61 of Chemical Abstracts under the headings light, photochemistry, and pyridine.##

04286

K. F. Preston and R. J. Cvetanovic

ON THE POSSIBLE CONTRIBUTION OF A MOLECULAR MECHANISM TO THE PHOTODECOMPOSITION OF NITROGEN DIOXIDE. Can. J. Chem. 44, 2445-8, 1966.
CFSTI, DDC: AD 642-455

The determination of the extent of O-atom exchange during the photolysis of mixtures of NO2 and O2(36) at 2537 Angstrom units and at other wavelengths has been investigated. This method is based on the underlying assumption that only free oxygen atoms are capable of exchange with O2(36) while other potential intermediates (such as, for example, NO2) are not. The exchange reaction is therefore used as a test for the involvement of free oxygen atoms in the photolysis of NO2.##

04294

E. T. Seo and D. T. Sawyer

ELECTROCHEMICAL OXIDATION OF DISSOLVED SULPHUR DIOXIDE AT PLATINUM AND GOLD ELECTRODES. Electrochim. Acta 10, 239-52, 1965.

The electrochemical oxidation of dissolved sulphur dioxide has been studied at platinum and gold electrodes using voltammetric, chronopotentiometric and galvanostatic measurements. The effects of electrode pre-conditioning and solution pH on the mechanism and the kinetics of the electrode reaction have been determined. Oxidation of sulphur dioxide occurs by two mechanisms, one a pure electron-transfer process and the other a chemical oxidation by electrolytically formed metal oxide. With an activated platinum electrode the electron-transfer mechanism is the predominating process. The electron-transfer process is also predominant at an active gold electrode. For this process the rate-controlling step as well as the over-all process is a two-electron oxidation. (Author abstract)##

C4404

Purcell, T. C. and I. R. Cohen

PHOTOCXIDATION OF FORMALDEHYDE AT LOW PARTIAL PRESSURES OF ALDEHYDE. Environ. Sci. Technol., 1(10):845-846, Oct. 1967. 11 refs.

Although the photocxidation of aldehyde has been investigated in recent years, the bulk of the work has been carried out at relatively high concentrations of aldehyde and the need for more detailed investigations at low reactant concentrations helped to initiate this investigation. Formaldehyde at concentrations ranging from 1 to 30 ppm in air was irradiated in reaction containers fabricated from fluorinated ethylene-propylene copolymer. The irradiations were carried out at 23 + or - 1 C. Mixed banks of sunlight fluorescent (wavelength maximum at 3100 A) and blacklight fluorescent lamps (3600 A) were ordinarily used. Formaldehyde-air mixtures in FEP containers were also subjected to solar radiation during the summer and fall months. Concentrations of formaldehyde were determined by a modification of the chromotropic acid method. H2O2 concentrations were determined by the 8-quinolinol and catalyzed KI methods. Colorimetric observations revealed no peroxy acid in the reaction vessel. This suggests that performic acid has only transient existence if it is involved at all. On the other hand, the only identifiable oxidant produced in the photooxidation system was hydrogen peroxide.##

04407

F. P. Peck and B. N. Khanna

DISPERSION OF NITROGEN. J. Opt. Soc. Am. 56, (8) 1059-63, Aug. 1966.

The refractivity of nitrogen gas has been measured, with high relative precision, at vacuum wavelengths from 4679 A to 20 586 A. The Absolute value of refractivity for 5462 A, reduced to one atmosphere at 0 C., is 0.0002991. A dispersion formula fitting the data well at 15 C. is 10 to the 8th power (n-1)=6497.378 + 3073864.9/(144 sigma squared), where sigma is wave number in reciprocal microns. This is compared to Svensson's dispersion formula for air. Alternative dispersion formulas are discussed. Quantities related to dispersion are duduced: mean absorption frequency, effective total oscillator strength, dielectric constant, Verdet constant, and Rayleigh scattering coefficient. (Author abstract)##

04410

M. Steinberg

O3 AND NO2 FORMATION BY IRRADIATION OF A N2-O2 GAS MIXTURE IN A FLOWING SYSTEM AT ELEVATED PRESSURES. Brookhaven National

Lab., Upton, N.Y. (Rept. No. BNL50017(T-438.) Sept. 1966. 19 pp.

The aim was to develop information on the yield of ozone and nitrogen dioxide per unit energy deposited in the system, and on the radiation chemical kinetics in the flow reactor. This information is desired in order to determine the feasibility of the application of chemc-nuclear reactors to the synthesis of ozone from oxygen or air, and to the fixation of nitrogen from nitrogen-oxygen mixtures. The results of operating a flow system constructed on stainless steel with a 79% N2 and 21% O2 gas mixture in a Co60 gamma radiation field at an intensity of 675,000 rads/hr, indicate that at 68 atm pressure and 30 C a maximum G(NO2) value of 1.18 at a concentration of 89 ppm, NO2 is obtained. Only NO2 can be detected for residence times equivalent to doses above 1.35 megarads. At higher flow rates and thus shorter residence times, the NO2 concentration and yield decreases and O3 begins to appear. A G(O3) value of 4.68 at an O3 concentration of 22 ppm was reached. Below a residence time equivalent to a dose of 400,000 rads, only O3 is present with the NO2 decreasing to below detectable limits. Increasing the pressure from 68 to 680 atm appears to have a small decreasing effect on the NO2 yield and a larger increasing effect on the O3 yield.##

04429

M. H. Bortner

AN EXPERIMENTAL STUDY OF THE DEIONIZATION OF NO PLUS. General Electric Co., Philadelphia, Pa., Missile and Space Div. (Scientific Rept. No. 1.) (Rept. No. AFCRL-65-391.) Apr. 1965. 30 pp.
DDC, AD 619-252

An experimental study of the deionization of NO plus was carried out. The ions were formed by a Penning effect collision between metastable argon atoms and NO molecules. The process was efficient. The deionization process was a combination of the dissociative recombination NO(plus) plus e yields N plus O and the mutual neutralization NO(plus) plus NO2 (-) yields NO lus NO2, the NO2(-) being formed by a three-step process -- Penning dissociation of NO, 3-body formation of NO2 from O and NO, and 3-body attachment to NO2. If all the deionization were due to the NO(plus) plus e reaction the rate constant found would be 2 x 10 to the 7th power plus or - 0.5. Reasonable assumptions allow a crude estimate of the NO (plus) plus NO2 rate constant of 2 x 10 to the -8th power plus or minus 1. (Author abstract)##

04437

A. V. Phelps W. H. Kasner

STUDY AND EXPERIMENTAL WORK ON ATOMIC COLLISION PROCESSES OCCURRING IN ATMOSPHERIC GASES. Westinghouse Research Labs.,

Pittsburgh, Pa., Atomic and Molecular Sciences Research and Development. (Technical Progress Letter 45.) (Research Memo 66-6E2-Gases-M1.) Feb. 28, 1966. 5 pp.
DDC, AD 480800

Initial tests using single microwave power pulses on N2 - Ne gas mixtures indicated agreement within 4% between the room temperature recombination coefficients for N2 plus ions and electrons obtained via the single pulse and recurrent modes of operation. Using the glass-aluminum flow tube, destruction of negative oxygen ions in O-O2 mixtures has been observed when the atomic oxygen discharge source is operating. During tests with the mass spectrometer in mixtures of CO-O2 H2-O2 and NO-O2, reactions consistent with associative detachment were observed.##

04454

A. A. Armstrong, Jr. and W. K. Walsh

RADIATION-INDUCED OXIDATION OF HYDROCARBONS. North Carolina State Univ., Raleigh, Dept. of Textile Chemistry. (Rept. No. ORO-634.) July 15, 1965. 40 pp.
CFSTI, ORO-634

The radiation-induced oxidation of ethane, propane and isobutane was studied in a flow-type reactor using hydrogen bromide as a catalyst. A Cobalt-60 source (Gammacell 220) was used for the irradiation. The exposure dose rate inside the reactor was approximately 180000 r./hr. In the oxidation of ethane, a G-value of 800 was obtained for the production of acetic acid. An increase in total flow rate of ethane to the reactor increased the production rate of acetic acid. The most pronounced effect was noted from an increase in pressure. An increase in the rate of production of acetic acid of 8 times was obtained by increasing the total pressure from 1 to 4 atm. In the oxidation of propane, a G-value of 10,000 was obtained for the production of acetone. Increases in total flow rate did not affect the rate of production. An increase in total pressure up to 3 atm. increased the rate of production of acetone but decreased the rate above that. At 4 atm., corrosion products were deposited on the reactor surface which accounted for the decrease in the rate of production of acetone. In the oxidation of isobutane, the products were t-butyl bromide, methyl bromide and water. The expected products of t-butyl hydroperoxide and di-t-butyl peroxide as reported by other investigators were not present. The radiation-induced oxidation of propane to acetone was the only reaction studied that gave a G-value high enough to look promising. Although the radiation-induced oxidation of propane to acetone looked attractive from the standpoint of radiation yield, it now is impractical from an economic viewpoint. (Author abstract)##

04456

R. D. Doepker and P. Ausloos

PHOTOLYSIS OF CYCLOBUTANE AT PHOTON ENERGIES BELOW AND ABOVE

THE IONIZATION ENERGY.. J. Chem. Phys. 43 (11) 3814-9, Dec. 1, 1965.

The photolysis of cyclo-C4H8 and cf cyclo-C4H8-cyclo-C4D8 mixtures was investigated at 1470 and 1236A in the absence and presence of NO. In addition, a series of experiments carried out in which H2S was used as a free-radical interceptor in the photolysis of cyclo-C4D8 at 1236 A.. Approximately 90% of the observed products can be accounted for by the primary process: C4H8+hv yields 2C2H4. The extent tc which the internally excited ethylene formed in this process will decccmpose further increases with diminishing pressure and wavelength. The photolysis of cyclobutane was investigated at energies above the ionization energy (I.E.=10..3eV), using the argon resonance lines at 11.54 and 11.72 eV. It is shcwn that when NO is added to the system, cis-2-butene, trans-2-butene, and 1-butene are major products. These butenes are, however, not produced when NO (I.E.=9..25 eV) is replaced by 02 (I.E.=12.1 eV) and are only formed in trace amounts when no additives are present. It is suggested that the parent icn acguires the olefinic structure and undergoes charge exchange with NO. (Author abstract) ##

04465

H. Harrison and D. M. Scattergood

UPPER LIMITS FOR CHEMILUMINESCENCE FROM SINGLE COLLISIONS OF O3 WITH NO, CO, H2S, AND CS2. Boeing Scientific Research Labs.., Seattle, Wash., Geo-Astrophysics Lab. (Rept. No. D1-82-0480..) Jan. 1966. 26 pp.
DDC-AD 630 017

Double modulated, crossed molecular beam experiments were performed which permit upper limits to be set for the production of light from single, thermal energy collisions of ozone with NO, CO, H2S, and CS2. Minimum detectable signals were limited by background light levels from a temperature sensitive surface reaction involving ozone. With the apparatus walls cooled by liquid nitrogen, this reaction still generated a partially single-modulated detector noise whose dc ccunt rate as 100/sec. Beam densities were determined with an electron-ionization stagnation detector, operated at 20 cps, and photomultiplier luminous efficiency was measured by comparison with a standard lamp.##

04475

S. Posner and J. Bennick

PREPARATION OF INSOLUBLE AEROSOLS CONTAINING MIXED FISSION PRODUCTS. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Dept. of Aerosol Physics. (Rept. No. LF-31.) July 1966. 14 pp.
CFSTI

The preparation of an insoluble aerosol containing mixed fission products, using an ion exchange of uranyl nitrate with montmorillonite clay is described. Ion exchange of an enriched solution of uranyl nitrate to clay particles is accomplished by adsorption. After spheroidizing by encapsulation the exchanged material is sealed in a quartz vial and irradiated for 12 hours in a thermal column of the Omega West Reactor at Los Alamos, New Mexico. Evaluation by gamma ray spectroscopy reveals the quantitative fission product inventory for the exposure period; calculation indicated an approximate 26 per cent uptake of uranylions by the clay. Results indicate this method to be feasible and practicable and future studies will include evaluation of particle size versus ion uptake, fission product build-up for various exposure times and pilot runs of aerosolization for exposure to animals. (Author abstract)##

04528

A. V. Phelps and W. H. Kasner

STUDY AND EXPERIMENTAL WORK ON ATOMIC COLLISION PROCESSES OCCURRING IN ATMOSPHERIC GASES. Westinghouse Research Labs., Pittsburgh, Pa., Atomic and Molecular Sciences Research and Development. Aug. 31, 1965. 4 pp.

The major portion of the present report period was spent studying the temperature dependence of recombination in N2-Ne mixtures under conditions where N2+ is the dominant ion specie. These measurements were confined to the temperature range 205 to 455 K. The upper end of the temperature range was limited by the presence of impurity ions in the afterglow. The observed recombination coefficients range from (3.0 plus or minus 0.2) x 10 to the minus 7th power cc/sec at 205 K to (2.8 plus or minus 0.2) x 10 to the minus 7th power cc/sec at 455 K, the limits of error representing the scatter of the data and not the absolute accuracy of the measurements. At a given temperature the results show no systematic dependence on the nitrogen or neon pressures. Temporal mass analysis indicates similar decay rates for the N2+ ions and for the electrons over the major portion of the afterglow period. Most of the report period was spent in obtaining data with the rf mass spectrometer which will be used with the flow tube for ion identification. Further studies on CO2-O2 mixtures yielded a reaction rate of 1.3 x 10 to the minus 29th power sq. cc/sec for the three body conversion of O2- to CO4- and a rate of 1.3 x 10 to the minus 28th power sq. cc/sec for the conversion of O- to CO3-. Mixtures of nitrogen and oxygen were also investigated but no complex negative ions were detected. In pure water vapor no attachment was observed for E/p less than 8 V/cm/Torr, but for E/p greater than 8 V/cm/Torr seven negative ions, H-, OH-, (H2O)n.CH- (where n equals 1,2,3,4,5) were observed. In oxygen-water vapor mixtures large numbers of negative ions were also observed.##

04556

A. Swinarski and J. Siedlewski

INFLUENCE OF ADSORBED OXYGEN ON THE CATALYTIC PROPERTIES OF

ACTIVATED CARBON. (Wplyw Adscrbowanego Tlenu Na Wlasnosci Katalityczne Wegla Aktywowanego.) Roczniki Chemii 35, 999-1008, 1961. Pol. & Fr. (Tr.)

The catalytic properties of activated carbon in the H2S oxidation reaction were studied and compared with the results obtained by using carbon previously desorbed and saturated with oxygen after desorption. The composition of oxidation products and the effect of moisture content on this composition were determined. Comparison of the available information on oxygen adsorption on carbon pores with the results obtained in the present work indicates that the prevailing views can be supplemented with a working hypothesis which would require comprehensive confirmation: prior to being used as a catalyst for H2S oxidation, carbon adsorbs oxygen in its pores, which in part is bound irreversibly in the form of C(x)O(y) surface complexes. The amount of the resultant complexes depends on the oxygen concentration in the gas surrounding the carbon. The oxygen contained in the gas from which H2S is being removed is adsorbed on carbon reversibly. It undergoes instant activation, which increases with time. The degree of this activation depends on the amount of surface C(x)O(y) complexes formed on the catalyst pore surfaces. These complexes have varying stability, and strong desorption at 450 C causes most of them to be decomposed. The oxidation of S2(-) to S4(+) in accordance the scheme, 2H2S + 3O2 = 2SO2 + 2H2O, depends not only on the H2S:O2 ratio in the reaction mixture, but is greatly affected by the moisture content of the medium, a circumstance mentioned by Courty. The assumption that complete oxidation of H2S proceeds through combined reactions and 2SO2 + 4H2S = 6S + 4H2O constitutes a postulate which goes further than Prettre's assumptions. These conclusions derive both from an analysis of previous results and from the fact that at H2S:O2 = 1:0.625 oxygen-containing sulfur compounds are obtained in the reaction products. This ratio is considerably lower than that predicted by Prettre.##

04578

I. C. Hisatsune

THERMODYNAMIC PROPERTIES OF SOME OXIDES OF NITROGEN. J. Phys. Chem. 65, 2249-53, Dec. 1961.

Available spectroscopic and structural data were used to calculate the thermodynamic functions for NO3, N2O3, N2O4 and N2O5, and dissociation equilibria of these oxides. For the N2O5 dissociation, the necessary functions for NO3 radical were estimated from vibrational frequencies calculated with Urey-Bradley force constants. These data together with those obtained from other sources lead to the estimated properties for ideal gases at one atmosphere and 25 degrees. (Author abstract modified)##

04580

I. C. Hisatsune, J.P. Devlin, Y. Wada

VIBRATIONAL SPECTRUM AND STRUCTURE OF N2O5. Spectrochim. Acta 18, 1641-53, 1962.

The infrared spectrum of N2O5 in the 2-35 micron region was obtained in the gas and solid phases. In the solid phase, the temperature dependence of the spectrum and the changes in the spectrum accompanying the covalent to ionic transformation of the molecule were observed. Infrared and Raman data are consistent with the C2NONO2 structure with a bent central N - O - N group. These data give no indication of the relative orientation of the nitro groups. However, the data do suggest that in the gas phase the potential barrier against internal rotation of the nitro groups is low. Both entropy calculation and approximate normal coordinate calculation show that the N - O - N angle deformation frequency may be about 85/cm. (Author abstract) ##

04583

J. Heicklen, and H. S. Johnston

PHOTOCHEMICAL OXIDATIONS. II. METHYL IODIDE. J. Am. Chem. Soc. 84, 4030-9, 1962.

The room-temperature photo-oxidation of methyl iodide (0.2 to 3.0 mm.) in oxygen (0.030 to 10 mm.) with continuous UV radiation above 2200 A. was studied. Observations were made by leaking the reaction mixture directly into the electron beam of the mass spectrometer during photolysis. The principal products of reaction were I2, H2CO, CH3OH and under some conditions CH3OOH; minor products were H2O, CO2, HCOOH, CH3OOCH3 and CH3OI. Because of the cracking pattern of the reactants and major products and the background air peaks, it was impossible to establish the presence or absence of CH4, CO and HI. There are conflicting claims in the literature as to whether methyl radicals react with oxygen according to CH3 + O2 (+ M) = CH3O2 (+ M) (followed by the Vaughn mechanism) or CH3 + O2 = H2CO + HO (Followed by HC attack on loosely bound hydrogen atoms). This study indicates both processes do occur, with the first being more important under conditions used here. It seems probable that oxygen molecules abstract hydrogen atoms from CH3O radicals to produce H2CO and HO2. A fairly complete and internally consistent mechanism is developed for the initial reaction, typically the reaction of about 0.0001 or 0.001 of the methyl iodide. As the reaction progresses, inhibition caused by CH3 + I2 equals CH3I + I becomes very pronounced, radicals abstract from H2CO, a large number of other secondary reactions seem to occur, and the mechanism proposed is regarded as exemplary rather than established. In terms of the relatively simple initial reaction, many ratios of constants are evaluated. (Author abstract) ##

04626

D. R. Coughanowr and F. E. Krause

THE REACTION OF SO2 AND O2 IN AQUEOUS SOLUTIONS OF MNSO4.
Ind. Eng. Chem. Fundamentals 4, (1) 61-6, Feb. 1965.

An experimental investigation was made to determine the rate of reaction of sulfur dioxide and oxygen in aqueous solution containing manganous sulfate as a catalyst. The catalyst was varied from 0 to 15 p.p.m. of MnSO4 in a batch method, and from 100 to 10,000 p.p.m. in a flow method. The temperature was 25 C. The reaction is zero order with respect to both sulfur dioxide and oxygen. The concentration of manganous sulfate has a large effect on the rate of reaction; from 0 to 100 p.p.m. of manganous sulfate, the reaction rate constant, k, is proportional to the square of the catalyst concentration, but above 100 p.p.m., k increases less rapidly up to about 500 p.p.m., after which k increases very slowly with catalyst concentration. The reaction is easily inhibited by very small amounts of contaminant.##

04633

P. A. Leighton

SOME REMARKS ON THE NITRIC OXIDE -- NITROGEN DIOXIDE CONVERSION.
Preprint. (Presented at the Air Pollution Research Conference on "Atmospheric Reactions," Univ. of Southern California, Los Angeles, Calif., Dec. 5, 1961.)

Nitric oxide-nitrogen dioxide photochemical conversion theory is reviewed. It has been almost universally postulated that the products of oxygen-olefin and possibly ozone-olefin reactions, which promote the above mentioned conversion, are free radicals. The extent to which these reactions produce radicals and the nature of the radicals produced in air have not been established. Other unresolved questions pertaining to this conversion reaction involve reaction kinetics and reactant concentrations.##

04653

J. M. Singer, E. B. Cook, M. E. Harris, V. R. Rowe, J. Grumer

FLAME CHARACTERISTICS CAUSING AIR POLLUTION: PRODUCTION OF OXIDES OF NITROGEN AND CARBON MONOXIDE. Bureau of Mines, Pittsburgh, Pa. (Presented at the Symposium on Combustion Reactions of Fossil Fuels, 152nd National Meeting, American Chemical Society, New York City, Sept. 11-6, 1966 and at the Basic Research Symposium, Chicago, Ill., Mar. 14, 1967.) 40 pp.

Concentrations of nitrogen oxides and carbon monoxide in combustion gases of lean, stoichiometric, and rich propane-air flames are predicted from theoretical kinetic and thermodynamic calculations. Experimental values are higher than the theoretical by factors of 2 to 7. Lowering the primary flame temperature with cold flue gas reduces the nitric oxide and increases the carbon monoxide concentrations. Cooling rates of 5500 degrees to 10,000 degrees R/sec starting at about 3500 degrees R maintain the nitric oxide in the primary combustion zone at the initial value and do not prevent oxidation of the carbon monoxide.##

04668

W. L. Slater R. M. Dilie

PARTIAL COMBUSTION OF RESIDUAL FUELS. Chem. Eng. Progr. 61, (11) 85-8, Nov. 1965.

Partial oxidation of residual fuel oils produces high purity synthesis gas containing hydrogen, carbon monoxide, carbon dioxide, methane, and only minor traces of impurities. The methane concentration in the synthesis gas produced at elevated pressures corresponds to equilibrium conditions. Although the studies of the process have been made at pressures up to 1,500 lb/sq in gauge, there have been no indications that this pressure can nct be increased several fold. The soot produced from heavy oils is water-wettable, has oil adsorption numbers of 150 to 500 lb/100 lb, and has specific surface areas of 100 to 1,200 sq m/g. The oil adsorption number of the soot increases directly with the steam/oil ratio in the feed to the synthesis gas generator. (Author conclusions)##

04771

L. J. E. Hofer, P. Gussey, and R. B. Anderson

SPECIFICITY OF CATALYSTS FOR THE OXIDATION OF CARBON MONOXIDE ETHYLENE MIXTURES. J. Catalysis 3, (1-6) 451-60, 1964. (Presented at the Catalysis Club Spring Symposium, Pittsburgh Pa., May 10, 1963.)

The specificity of 5 different catalysts for the oxidation of ethylene and carbon monoxide was determined in a microcatalytic reactor at temperatures from 50 to 600 C. On all 5 catalysts CC oxidized more readily than ethylene. Complete removal of CC occurred on the cobalt oxide at room temperature, on the copper oxide-chromium oxide on alumina catalyst at 100 C, on both copper oxide and iron oxide at 200 C, and on chromium oxide at 450 C. On cobalt oxide, iron oxide, chromium oxide, and the copper oxide-chromium oxide on aluminum oxide the presence of CO enhanced the oxidation of ethylene. Conversely the presence of ethylene inhibits the oxidation of CO markedly in the case of cobalt oxide and iron oxide. Significant chemisorption at any

temperature was not observed for chromium oxide or copper oxide. The other 3 catalysts showed significant quantities of chemisorption for both ethylene and CO. With chromium oxide, ferric oxide, and cobalt oxide, hydrogen was produced in amounts up to 2% of the hydrogen in the initial ethylene. (Author abstract)##

04801

E. Matijevic, K. F. Schultz, and M. Kerker

LIGHT SCATTERING OF COATED AEROSOLS. II. SCATTERING BY LINOLENIC ACID AEROSOLS. J. Colloid Sci. 17, (1) 26-38, Jan. 1962. (Presented at the 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

Linolenic acid aerosols exhibiting higher order Tyndall spectra and comparable in monodispersity to monodisperse sulfur sols have been prepared reproducibly using silver chloride nuclei. Particle size distributions can be obtained precisely by analysis of the light-scattering data and when appropriate precautions in sampling are observed, excellent agreement with electron microscope counts is found. Samples are fixed for electron microscopy by treatment with OsO4. The influence of boiler temperature, nuclei concentration, and dilution of the aerosol upon the light scattering and particle size distribution has been considered. (Author abstract)##

04831

Merryman, Earl L. and Arthur Levy

KINETICS OF SULFUR-OXIDE FORMATION IN FLAMES: II. LOW PRESSURE H2S FLAMES. J. Air Pollution Control Assoc., 17 (12): 800-806, Dec. 1967. 18 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 11-16, 1967.)

The microstructure of 0.1- and 0.05- atmosphere, lean H2S-O2-N2 flames is developed using the mass-spectrometric flame-sampling technique. The flame mechanism developed is in agreement with that determined from an earlier study on 1-atm H2S flames. The formation of SO2 appears to be primarily related to the production of SH and the ensuing oxidation steps SH plus O2 equals SO + OH and SO + O2 = SO2 + O. While there is some question whether SO2 formation occurs via an SO OR AND S2O intermediate, the present study does not give direct support to the role of S2O in the oxidation mechanism. However, the presence of significant quantities of free sulfur in the pre-flame zone may be indicative of S2O formation via SO + S yields S2O, and, possibly, via the disproportionation of SO, 3SO yields S2O + SO2. Kinetic analyses of some of the pre-flame reactions indicate an apparent activation energy of 17,300 calories/mole for the decomposition of H2S. The actual

initiation process in the flame mechanism requires further examination. The specific rate for the reaction step H2S + O = CH + SH is given by k6 = 1.45 x 10 15 exp (-6600/RT) cm3 mole -1 sec-1, and the specific rate for the oxidation of SO, SO + O2 = SO2 + O, is given by k5 = 5.2 x 10 14 exp (-19,300/RT) cm3 mole-1 sec-1. (Authors' abstract)##

04863

E. A. Schuck and E. R. Stephens

QUANTUM YIELDS DURING DILUTE GAS PHASE PHOTOLYSIS OF ETHYL NITRITE IN THE 3500 A. REGION. Environ. Sci. Technol. 1, 138-43, Feb. 1967.

Parts per million concentrations of ethyl nitrite (EtONO) were photolyzed in the absence and presence of added nitrogen or NO. The light source employed had its intensity maximum at 3500 A. with 85% of its energy confined to the 3300 to 3750 A. region. The phi was usually much less than unity and decreased as the concentration of EtONO or added gas was increased. Above an initial EtONO of 20 p.p.m., or in the presence of added gases, the reaction followed a pseudo first-order rate law. In the absence of added gases and at initial EtONO concentrations, which were much less than 20 p.p.m., the reaction tended to follow a second-order relationship. A mechanistic approximation of the results can be obtained by assuming the existence of two equally important primary processes. These are cleavage at the RO-NO bond and formation of an excited state. Recombination of the initial fragments from RO-NO bond cleavage and collisional deactivation of the excited state appear to be important secondary reactions. The choice between these two primary steps may involve the rotational isomers. Product analysis showed that 80% of the carbon was in the form of CH3CHO and 20% as EtOH. Thus, intramolecular rearrangement of the excited cis-isomer may be the major source of the CH3CHO. (Author abstract modified)##

04870

PHOTOLYSIS OF NITROGEN COMPOUNDS. Natl. Bur. Std. (U.S.) Tech. News Bull. 51, (4) 72-4, Apr. 1967.

In order to precisely define the amount of energy available to NO in this investigation of the photolysis of nitrogen compounds, gaseous nitrogen compounds and mixtures were irradiated with monochromatic light. Fluorescence of the excited species was obtained by passing a stream of sample gas through a reaction chamber across whichthe exciting light was directed. Reactions of a variety of mixtures and pressures of N20, NO2, NO, O2, and HN3 WERE STUDIED UNDER ¢U¢V RADIATION AT 1216¢A, A MIXTURE OF 1165 A, 1470 A and wavelenghts greater than 1600 A.. 1236 and 1165 A, 1470 A and wavelenghts greater than 1600 A.. Fluorescence of excited NO was obtained in beta and gamma bands

corresponding to different energy levels of excited NO. The beta band of NO fluorescence was obtained by photolysis of pure N20, but was replaced by gamma-band fluorescence with the introduction of even small amounts of NO for all exciting radiations except those of wavelengths greater than 1600 A. The suggested sequence of reactions originating from N20 and the N20 and NO mixtures with the emission of beta and gamma radiation respectively are discussed. The photodecomposition of the triatomic molecules NO2 and NOCl was studied by observations of the rotational and vibrational distribution of excited NO. In this study both beta and gamma bands were given off by NO2 subjected to the 1165 A - 1236 A mixture and to 1295 A; only the gamma bands were given off by NOCl subjected to the same radiations.##

04878

G. M. Richter, H. C. Wiese, and B. H. Sage

OXIDES OF NITROGEN IN COMBUSTION. Premixed Flame. Combust. Flame 6, (1) 1-8, Mar. 1962.

This investigation was undertaken to determine the effect of combustion conditions in premixed flames upon the formation of the oxides of nitrogen. Measurements were made of the residual quantity of the oxides of nitrogen in samples taken as a function of the spatial position in a cylindrical combustor. The influence of mixture ratio and of rate of flow of the reactants for a premixed, natural gas-air flame was studied. In addition the apparent temperature and mole fraction of carbon dioxide, oxygen and carbon monoxide were determined as a function of spatial position in the combustor. It was found that the local perturbation of pressure encountered in the combustion was one of the principal factors in increasing the residual quantities of oxides of nitrogen in the products of reaction. The results are presented in graphical and tabular form.##

C4913

J. B. Clin and B. H. Sage

AN EXPERIMENTAL STUDY OF THE FORMATION AND DECOMPOSITION OF NITRIC OXIDE. J. Chem. Eng. Data 5, (1) 16-20, Jan. 1960.

The experimental conditions for each of 65 tests upon the nitrogen-oxygen system and the initial and final compositions for the 65 tests are tabulated. The influence of the maximum apparent temperature upon the residual nitric oxide ratio is indicated schematically for compositions containing 0.4 mole fraction nitrogen, 0.2 mole fraction oxygen, and 0.4 mole fraction helium. A markedly higher nitric oxide ration for the same maximum apparent temperature was found for the tests in which the light piston was used (initial sample pressure of approx. 1.16 p.s.i.). Data for an initial sample pressure of approximately 4.62 p.s.i. shows much less, if any, difference

between the behavior with the light and the heavy piston. Variation in the nitrogen-oxygen ratio had relatively small influence upon the relationship of the residual nitric oxide ratio to the maximum apparent temperature. Approach to chemical equilibrium in the ballistic piston was established from a series of tests made with the piston weighing 3.29 pounds. Measurements were made upon mixtures which contained equal mole fractions of nitrogen and oxygen with 0.8 mole fraction helium and mixtures which contained 0.2 mole fraction nitric oxide with 0.8 mole fraction helium. The residual nitric oxide ratio resulting from the nitric oxide-helium sample decreased with an increase in the maximum apparent temperature. On the other hand, the residual nitric oxide ratio in the mixture of nitrogen and oxygen increased with an increase in the maximum apparent temperature.##

C4914

R. R. Sakaida, R. G. Rinker, Y. L. Wang, and W. H. Corcoran

CATALYTIC DECOMPOSITION OF NITRIC OXIDE. A.I.Ch.E. (Am. Inst. Chem. Engrs.) J. 7, (4) 658-63, Dec. 1961.

Catalytic decomposition of nitric oxide at a concentration of 0.404 and 0.432% by volume in nitrogen was studied in a tubular flow reactor. The packing consisted of alumina pellets impregnated with 0.1% by weight of platinum oxide and 3.0% by weight of nickel oxide. Tests were conducted at pressures of 1 to 15 atm. and temperatures from 800 to 1,000 F. A rate equation correlating the data as a function of temperature, pressure, and compositions was developed. A reaction mechanism compatible with the rate equation is proposed. The rate of the heterogeneous decomposition of nitric oxide over a platinum-nickel catalyst supported on activated alumina was found to be second order with respect to nitric oxide, retarded by atomic oxygen, and further retarded by the excess nitrogen in the system. The rate equation is applicable for the decomposition of nitric oxide present in nitrogen at concentrations of less than 0.5% within the temperature range of 800 to 1,000 F. and a pressure range of 1 to 15 atm.##

04926

K. C. Salooja

INFLUENCE OF POTASSIUM CHLORIDE ON COMBUSTION PROCESSES LEADING TO IGNITION. Combust. Flame 10, (1) 45-9, Mar., 1966.

Combustion studies were carried out on the following hydrocarbons: pentane, hexane, 2-methylpentane, 2,2-dimethylbutane, iso-octane, cyclohexane and methylcyclohexane. The oxygenated compounds studied included acetic acid, methyl formate, propionic acid, ethyl formate, methyl acetate, acetaldehyde, acetone, diethyl ether, isopropanol and methanol. Results are reported for only

one of the hydrocarbons studied, namely pentane, because the behavior of different hydrocarbons was generally similar. KCl markedly inhibited the oxidation process at all stages leading to ignition. In marked contrast to its effect on hydrocarbons, KCl promoted the pre-flame oxidation of acetic acid, propionic acid, methyl formate, ethyl formate, methyl acetate and acetone. It markedly inhibited the combustion of methanol and isopropanol. The effect of KCl on the ignition of acetic acid and acetone was not studied since these compounds ignite well above 600 C, but with propionic acid and the esters studied KCl strongly inhibited the onset of ignition despite its promoting effect on their pre-flame oxidation. The promoting effect on the oxidation of carbonyl compounds, particularly the lowering of the temperature at which oxidation commences, suggests a direct reaction between KCl and carbonyl compounds. Another observation is that, in contrast to the behavior in the clean vessel, KCl generally causes more CO2 to form than CO. Under the experimental conditions, KCl does not significantly catalyse the combustion of CO to CO2. Therefore, the greater formation of CO2 must arise from attachment of oxygen to the carbonyl progenitor of CO. The inhibiting effect of KCl on the combustion of hydrocarbons would seem to arise primarily from its effect on HO2 radicals formed prior to the appearance of carbonyl intermediates. The absence of any H2O2 in the products in KCl-coated vessels supports this view.##

04965

P. H. Krupenie

THE BAND SPECTRUM OF CARBON MONOXIDE. National Bureau of Standards, Washington, D.C., National Standard Reference Data Series 5. July 8, 1966. 93 pp.

The present work, first in a series on diatomic molecules, follows the approach of Lofthus and is devoted to a single molecule. This report includes a comprehensive review of the literature on the spectrum of CO, CO(+), and CO(2+) in the gas phase, and a compilation of critically evaluated numerical data on band positions, molecular constants, energy levels, potential energy curves, and other molecular properties derived from the spectrum. Estimates of reliability are given where possible. Papers from which the tabulated data have been extracted are discussed in the text of this report. Early data of presumably low precision have been included in the tabulations only where better or more recent data are not available. The references cited constitute a critical bibliography rather than an exhaustive one.##

04967

V. K. LaMer

THE PREPARATION, COLLECTION, AND MEASUREMENT OF AEROSOLS. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949. pp. 5-13.

In the study of aerosols, many difficulties are imposed by variations in particle size. These difficulties may be avoided by working with monodisperse liquid aerosols; in this paper, it implies preparations whose size distribution does not deviate by more than 10% from the mean value. The preparation and optical properties of monodisperse aerosols are described in detail. Included are an analysis of light scattering properties; use of the Mie theory; polarization techniques; optical obscuration by monodisperse fogs; filtration of aerosols; the forward angle Tyndallometer; and an evaluation of the cascade impactor.##

04992

A. J. Haagen-Smit, C. E. Bradley, M. M. Fox

FORMATION OF OZONE IN LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 54-6.

When bent pieces of rubber were exposed to sunlight in the presence of oxygen and nitrogen dioxide no cracking took place. Rubber cracked in nitrogen dioxide in air but not when the air was filtered through charcoal. Rubber cracked in 3-methylheptane and NO2 in air but not when either was used alone; it cracked when introduced to a mixture exposed to sunlight for several hours. Ozone was identified as the rubber-cracking material. Rubber cracked in some organic acids photooxidized with NO2 in air; ozone was again isolated and identified. Rubber cracked in gasoline photooxidized with NO2 in air. Ozone formed when 4-n-nonene was photooxidized with NO2 in air. Biacetyl in air cracked rubber when exposed to sunlight; ozone was identified. Rubber also cracked with biacetyl and NO2 in air. Rubber cracked in butyl nitrite in air exposed to sunlight. The concentrations of the organic materials and of NO2 were of the same order as those found in Los Angeles smog.##

05043

I. R. King

RECOMBINATION OF IONS IN FLAMES EFFECT OF TEMPERATURE. Texaco Experiment Inc., Richmond, Va. (Rept. Nos. AFOSR-463, TP-165A, and EXP 2789) Aug. 1, 1961. 5 pp.

The effect of temperature on the recombination rate of ions in a hydrocarbon-air flame is presented and the results compared with predictions based on present-day theories. Measurements were conducted with an alternate-probe technique in a propane-air flame burning on a Meker-type burner 5.5 cm in diameter. Two probes of different length, mounted at right angles to each other on a common shaft (the two probes being in a plane perpendicular to the shaft), entered the flame from the side, parallel to the flame front. By measuring current first with one probe, then with the other, and substracting the two readings, it was possible to determine the ion concentration in the center of the flame. An ion-ion process agreeing with the Langevin prediction is indicated.##

05047

N. R. Mukherjee, M. R. James, W. S. Hummers, H. Eyring, and T. Ree

STUDIES TO DETERMINE THE MECHANISM OF PRODUCTION AND REMOVAL OF ELECTRONS IN FLAMES. (Utah Univ., Salt Lake City.) (Rept. No. AFBMD-TR61-1 Aug. 8, 1961 37 pp.

Probable chain reactions and mechanism for the formation of the most abundant positive ions are summarized. A steady state analysis of reactions reveals a number of important conditions that must be fulfilled for the most abundant ion formation. Approximate values for the maximum and minimum concentrations of the most abundant ion with respect to oxygen are obtained. A semi-theoretical method is used to calculate the concentration of the most abundant ion in hydrocarbon-oxygen or hydrocarbon-air flames. Experimental studies have been performed on the effect of ultra-violet light on ion concentration in flames. Research has also been started on the effect of the degree of unsaturation, state of oxidation, and length of the carbon chain on ionization of various hydrocarbons in a hydrogen-oxygen flame.

05051

B. S. Rabinovitch, and D. W. Setser

UNIMOLECULAR DECOMPOSITION AND SOME ISOTOPE EFFECTS OF SIMPLE ALKANES AND ALKYL RADICALS. Washington Univ., Seattle, Dept. of Chemistry and Kansas State Univ., Manhattan, Dept. of Chemistry. June 1, 1964. 142 pp.

A theoretical study is reported on the nature of unimolecular reactions, their dependence on the energy parameters of the systems involved (photo-chemical or thermal), and their dependence on molecular structure. The relevant aspects of the RRKM formulation for unimolecular reactions are discussed. Emphasis is placed upon the present status of the theory, and the best techniques for carrying out computations. Characteristics of various model hydrocarbon-type molecular species which are used in theoretical calculations are outlined. Kinetic isotope affects are considered and model calculations presented for hydrogen-deuterium substitution. Consideration of reaction processes shows that a given hydrocarbon species can be produced at many different pressures, in a variety of energy states and with various hydrogen-deuterium isotopic compositions. Specific rate constant relationships to experimental parameter are discussed. The behavior of some C(1)-C(4) alkanes and alkyl radicals are calculated as examples of highly important practical systems. It is hoped this will provide useful insights into experimental situations.##

05058

D. E. Van Sickle and R. R. Mayo

OXIDATION OF UNSATURATED HYDROCARBONS (FINAL REPT. OCT. 1, 1961-SEPT. 30, 1963). Stanford Research Inst., Menlo Park, Calif. Jan. 10, 1964. 8 pp.

Research effort for the last two years was directed principally toward product studies of low temperature, liquid-phase olefin oxidations. Pure hydrocarbons were utilized where possible, azo initiators employed, and conversions limited to 5%. Correlation of the hydroperoxide produced with the remaining products found and assignment of relative rates for two chain propagation reactions were attempted. A secondary effort was the study of autocatalysis in oxidation. Cyclopentene was chosen as a model compound, since its oxidation mechanism is the simplest of the olefins studied. Decomposition and initiating properties of hydroperoxides also received attention. (Author introduction modified)##

05099

T. S. Nagarjunan, J. G. Calvert

THE PHOTOOXIDATION OF CARBON MONOXIDE ON ZINC OXIDE. J. Phys. Chem. 68, (1) 17-26, Jan. 1964.

The photooxidation of carbon monoxide on zinc oxide solid has been studied in experiments at 0 degrees. ZnO with presorbed oxygen was irradiated with 3660-A. light in the presence of CO gas. CO2 was formed in the irradiated system, while its rate of formation in the dark was negligible. The reaction was studied under varied conditions: the temperature at which the oxygen was presorbed on the ZnO, the pressure of oxygen during the presorption, the pressure of CO gas, the time of irradiation, and the intensity and the wave length of the absorbed light. The results confirm that oxygen is adsorbed in at least three different forms on ZnO in an amount which depends on the temperature of the treatment. Two of these types of adsorbed species of oxygen react with CO to form CO2 on irradiation, while the third type is inactive. The three types may be O2(-), O(-), and O(2-), with the first two the active forms. CO appears to react either from the gas phase or from a weakly adsorbed state. The reaction may occur through two different reaction paths, one much faster than the other. The quantum efficiency of the CO2 formation varies from 0.001 at high intensities to greater than 0.1 at low intensities at 3660 A. Some aspects of the detailed mechanism are considered. From these and other results some speculation is given concerning the contribution of photooxidations sensitized on suspended solid particulates to the chemistry of the polluted atmosphere. There is a high probability that such reactions are of little importance in the usual polluted atmosphere. (&28author abstract)
atmosphere. (Author abstract)##

05100

J. N. Pitts, Jr., H. W. Johnson, and T. Kuwana

STRUCTURAL EFFECTS IN THE PHOTOCHEMICAL PROCESSES OF KETONES IN SOLUTION. J. Phys. Chem. 66, 2456-61 (Dec. 1962). (Presented at the Symposium on Reversible Photochemistry Process, Durham, N.C., Apr. 1962.)

The primary objective of this investigation was to check the effect of substituent groups and location of substitution on the photoreduction of a series of benzophenone derivatives. The behavior of a series of hydroxy, methoxy, amino, and chlorobenzophenones in the photopinacol reaction was studied using product isolation, UV spectroscopy, phosphorescence, fluorescence, and EPR spectroscopy. Results and correlations derived from these studies are discussed herein. Some of these include the following: Ortho substitution by a number of functional groups has a pronounced effect on the "go - no go" photoproperties of the benzophenone derivatives. Replacing the OH or the CH3 by methoxy or carboxy restored the intermolecular hydrogen atom abstracting power of the benzophenone. This suggests that the deactivating effect of o-OH, NH_2, $NHCH_3$, and methyl groups is due to their tendency to form reversible photoenols. Ten and 24-hour irradiation at room temperature of degassed 0.01 M solutions of p-aminobenzophenone in isopropyl alcohol using a medium intensity mercury lamp produced no significant permanent changes. Strong phosphorescence was noted during irradiation in the rigid medium at 77 K., and EPR resonance signal due to the triplet state of 4-aminobenzophenone was observed. Long-lived phosphorescence was also observed for p-dimethylamino and p,p'-bis(dimethylamino) benzophenone. EPR studies of these and other para-substituted compounds are in progress. A preliminary report on a similar study in the anthraquinone system is included.##

05204

M. Nicolet

NITROGEN OXIDES IN THE CHEMOSPHERE. Pennsylvania State Univ., University Park, Dept. of Electrical Engineering. Dec. 10, 1964. 32 pp. (Scientific Rept. No. 227.) (Rept. No. AFCRL-64-939.)

A study is made of the various reactions in which nitrogen oxides are involved in the chemosphere. The hydrogen compounds do not play an important role, and it is found that the essential aeronomic reactions depend on ozone and atomic oxygen. Thus, the ratio nitrogen dioxide-nitric oxide can be determined. The absolute values of the NO2 and NO concentrations depend on the dissociation of molecular nitrogen in the chemosphere. The chemical conditions cannot be applied in the mesosphere since the life-time of NO is relatively long, and a downward transport is involved. Very special assumptions concerning chemical reactions would be necessary to reconcile the photochemical picture and the observational results. The introduction of ionic reactions, considered in an accompanying paper, will lead to a correct interpretation. (Author abstract)##

05208L

T. J. Wallace, and N. Friedman

FUNDAMENTAL INVESTIGATION OF THE CATALYTIC DEGRADATION OF HYDROCARBON FUELS (FIRST QUARTERLY PROGRESS REPT. FEB. 16-MAY 16, 1965.) ESSO Research and Engineering Co., Linden, N. J., Process Research Div. May 16, 1965. 30 pp. (Rept. No. 1).

The reactivity of dilute solutions of benzaldehyde phenyl hydrazone (BPH) and tolyl phenyl hydrazone (TPH) in benzene toward molecular oxygen has been determined at 25 to 30 C. and one atmosphere pressure of oxygen. Both hydrazones oxidized readily under these conditions with TPH being more reactive than BPH. This reactivity difference is probably due to the electron-donating capabilities of the methyl group. It suggests that electron-attracting groups will decrease the reactivity of the initial hydrazone but accelerate the decomposition of the peroxide which is formed. The stoichiometry of the above reactions was determined. Each mole of oxygen consumed reacts with one mole of hydrazone to produce one mole of peroxide. The disappearance of the hydrazone is best represented by a pseudo first order kinetic plot. Good reproducibility of the rate constants was observed. The rate-determining step is, most likely, hydrogen atom and cumene in benzene at 25 to 30 C. About 8 to 10% oxidation of each hydrocarbon was observed under these mild conditions. In the absence of BPH, no oxidation of indene was observed over a 72 hour period. Infrared data show that indene is converted to products which contain a carbonyl linkage. To date, attempts to oxidize tetralin have been unsuccessful. (Author abstract) ##

05226

E. Ferht, and R. A. Back

THE REACTION OF ACTIVE NITROGEN WITH MIXTURES OF ETHYLENE AND NITRIC OXIDE . Can. J. Chem. 43, 1899-904, 1965. (Presented at the Annual Conference, Chemical Inst. of Canada, Kingston, June 1964, N.R.C. No. 8406.)

The reaction of active nitrogen, produced in a condensed discharge at 1 mm pressure, with mixtures of ethylene and nitric oxide has been studied with mixtures ranging in composition from pure ethylene to pure nitric oxide. The sum of HCN + 14N15N produced from mixtures of C2H4 and 15NO remained constant and equal to the HCN produced from pure C2H4 for NO concentrations up to 50 mole %. As more NO was added, this sum rose towards the value of 14N15N produced from pure 15NO. These data appear to lend support to the HCN yield from ethylene as the true measure of nitrogen atom concentration. It is suggested that 15NO also undergoes a concerted reaction with excited 14N14N molecules, to produce 14N15N, and that these excited molecules can quenched by collision with ethylene or methane without consuming nitrogen or forming HCN. (Author abstract)

05246

C. S. Naiman, M. Y. Dewolf, and J. Schwartz

STUDIES OF THE EFFECT OF LASER RADIATION ON CHEMICAL ACTIVATION AND VAPOR FOG NUCLEATION (QUARTERLY PROGRESS REPT. NO. 1). Mithras, Inc., Cambridge, Mass. Nov. 1964. 17 pp. (Rept. No. MC 64-110-R1.)

The first objective is the study of various effects of laser radiation upon vapor and liquid systems comprised of, but not limited to, the simulant dimethyl methylphosphonate (DMMP) on air components or both. The second objective is to obtain basic information on the condensation of vapor or aerosol fogs as a result of laser radiation. The chemical shifts, coupling constants, and relaxation times of the methyl and methoxy protons in DMMP have been measured by nuclear magnetic resonance (NMR) techniques. Effects of focused and unfocused, Q-switched and non-Q-switched laser radiation on methanol vapor in a continuously sensitive cloud chamber have been studied; a much less intense laser beam can produce condensation by incidence on a suitable surface than is required to produce tracks directly with a focused beam. A cloud chamber has been tested with low vapor pressure materials, such as water, to determine the modifications that are necessary, in order to study DMMP in the cloud chamber. From NMR studies, it was concluded that background information about the conventional NMR spectrum and relaxation times is both essential and measurable. (Author abstract)

05248

Newhall, H. K.

CHEMICAL EQUILIBRIUM PROPERTIES OF AMMONIA-AIR COMBUSTION PRODUCTS. California Univ., Berkeley, Dept. of Mechanical Engineering. (Rept. Nos. TR-1 and HPS-64-4.) DEC. 1, 1964. 80 pp.

Results of the machine calculated thermodynamic properties of reacted ammonia and air are presented. The resulting properties are available to use as is or for further utilization in predicting air breathing engine performance, where the fuel is ammonia. The principal portion of this report is embodied in the tabulation of species distribution and thermodynamic properties. Included are ammonia--air mixture equivalence ratios ranging from 0.2 to 1.4, where 1.0 represents chemically correct. The range of ratios allows for application to Otto, Diesel or Brayton cycles. All numerical results are based upon the products of combustion resulting from the reaction of one pound of air with the requisite weight of ammonia. In the determination of product composition, the following chemical species were considered to exist in chemical equilibrium: CO2, CO, H2O, H2, NO, OH, N2, O2, H, N, O and Ar. While traces of additional components might theoretically exist, their concentrations would be so small as to

be negligible for the purpose of this work. All basic thermodynamic data employed in this work has been obtained from the Joint Army, Navy, Air-Force Thermochemical Tables, which is presently the most universally accepted source of thermo-chemical data. Two previously developed digital computer programs, one of them being for air fuel ratios greater than stochiometric proportion, were used for determination of products over a wide range of temperatures, pressures and fuel-air ratios. For each pair of temperature and pressure values selected, the following data is presented: (1) Chemical composition of products of combustion; (2) Internal energy of products of combustion; (3) Entropy of products of combustion; and (4) Volume of products of combustion.

05253

A. V. Phelps, and G. J. Schulz

ATOMIC COLLISION PROCESSES RELATING TO THE IONOSPHERE. Westinghouse Research Labs., Pittsburgh, Pa., Dept. of Physics. (Dec. 3, 1964.) 3 pp. (Research Memo. 64-9E2-113-M3.)

I. Mass Spectrometer with Ion Velocity Filter: In the course of work on the production of O(-) from CO it was found that, apart from the main resonance capture peak in the cross-section occurring at about 10 eV, small subsidiary peaks exist at higher energies, but below the threshold for pair production, presumably due to processes of the type e+ CO = C(-) + C (electronically excited). II. High Pressure Mass Spectrometry: The mechanisms of formation of N (4+) and O (3+) ions in ion-molecule interactions in N2 were investigated further. The results indicated that the N(4+) ion is formed through processes involving (2); Ne82S) (A2 pi sub u) and Ne82S) (B sigma(+) sub u). The N(3+) ion formation appearance potential (21.1 ev) is consistent with the reaction N(2+)(excited) =N(3+) + N. It is further established the N(+) ion does not enter into the formation of N(3+) ions. There is some indication that at high pressures (greater than 200 microns) the current changes from a quadratic to a linear dependence on pressure. N(2+) formed from four body reactions was observed. III. Transmission experiments: The transmission experiment has been developed for a study of resonances in the elastic scattering of atoms under circumstances in which the resonance is small (say less than 3% of the elastic cross section). The resonance in the elastic cross-section of atomic hydrogen was found at an energy of 9.7 + or - 0.1 5 eV. This result is in excellent agreement with the predictions of theory.

05265

R. F. Stebbings

MEASUREMENTS OF ATMOSPHERIC ION REACTIONS (YEARLY TECHNICAL SUMMARY REPT. APR. 1, 1961-JULY 31, 1962. General Dynamics Corp., San Diego, Calif., General Atomic Div. (July 31 1962) 20 pp. (Rept. Nos. DASA-1330; GA-3351.)

Developments in several aspects of this research are discussed: (I) Charge Transfer in N2, O2 and NO - Through improvements in design and experimental technique ion energy measurements down to 20 ev were made. The damaging effects of space charge fields which increase with decreasing energy, were minimized by arranging so that the path length traversed by the low energy ions would be small. The influence of the slow-ion collection field on the primary ions was diminished through redesign of the electrode structure in the interaction region. Oxygen Atom Source Development - An rf discharge was used for dissociating oxygen molecules; design of the discharge tube is disucssed. Charge Transfer in Atomic - Oxygen - Apparatus for this investigation is discussed. The ions were produced in an electron bombardment ion source and were focused and magnetically mass-analyzed before arrival at the experimental chamber and additional focusing and collimation were provided before intersection of the neutral beam by the ion beam. Cross sections for the charge transfer between atomic oxygen and N(plus), N2(plus), and O2(plus) ions are presented. Ion - Molecule Reaction Studies - Modulated crossed beam techniques are being applied to the study of ion-molecule reactions of the general type X(plus) Y2 equal XY(plus) plus Z The apparatus is discussed. At the present the signal resulting from the reaction O(plus) plus N2 equal NOPlus) plus N is below the noise level, but improvements in the apparatus should make this and similar reactions observable.##

05267

H. A. Taylor, and D. S. Sethi

NITRIC OXIDE PHOTOLYSIS (FINAL REPT.). New York Univ., Bronx, N.Y. (Aug. 31, 1965.) 4 pp. (Rept. No. CR 68048.)

An Aerograph gas chromatograph was used with a millivolt range recorder. The absorbent was a six inch column of silica gel, used at room temperature with helium as the carrier gas at flow rates in the range of 60-65 ml/min. Samples were injected using a gas-sampling value connected directly to a vacuum system, pressures being measured on an octoil manometer. In elution, N2, NO and NO2 were removed in the first ten minutes and N2O around twenty minutes. The NO and NO2 peaks were not always separable, the one appearing as a shoulder on the other peak at some concentrations but the retention of the N2O permitted easy separation and therefore recognition. By calibrating standard mixtures of N2, NO, NO2 and N2O, a lower limit for the detection of N2O was established at 10 to the-8th power mole. Some twenty photolyses of NO at 1470 A were made and the products analyzed by the new procedure. None of these showed any N2O. Since there appeared to be some small variation in the retention time of N2O from sample to sample of the calibrating standards, the photolysis product analysis was sandwiched between two standard runs. No N2O peak appeared. In an effort to increase the concentration of NO2 with which N atoms might react during photolysis, small amounts of oxygen were added to the NO before photolysis. Still no N2O could be found. Finally, small amounts of N2O were added initially to the NO and the mixture photolyzed at 1470 A. The products after the run contained no N2O. It is apparent that during the period of the

photolysis any N2O that might be produced was decomposing. It is to be concluded that the N2O, suspected in the earlier work reported in the accompanying reprint, was actually CO2 and that under the experimental conditions with a duration of photolysis of from 15 to 20 minutes no N2O is present among the final products. While definitely answering the question of the presence of N2O in the system studied earlier, it must be realized that another question is posed in its place, namely, if the duration of the photolysis were shortened, could N2O be found among the products before its decomposition. To investigate this, as well as to attempt to answer the question of the effect of a change in the duration of photolysis, a research assistant has undertaken as his doctoral problem, NO photolysis at 1470 A by a flow method.#

C5268

E. R. Stephens

ABSORPTIVES FOR INFRARED DETERMINATION OF PEROXYACYL NITRATES. Anal. Chem. 36 (4), 928-9 Apr. 1964).

As it has become apparent that the absorptivities given in the published PAN spectrum are too low by a factor of about two, probably because of some error in measurement of the concentration, new measurements were made and are reported. Because these compounds are highly explosive, the determination of their absorptivities presented special problems. Two independent methods were eventually developed. In the first, a pressure-volume technique (PV), a glass bulb of known volume on a vacuum line was filled with a measured pressure of PAN vapor. This was brought to one atmosphere with nitrogen and then swept into the long patch cell (volume, 640 liters; filled with air at atmospheric pressure). This produced a concentration of a few parts per million which gave sufficient absorption for measurement at a path length of 120 meters. This technique eventually yielded reproducible results for the first two members of the series, PAN and PPN. The vapor pressure of PBN is too low to apply this technique with available equipment. The second technique consisted of filling a lambda pipet (5 microliter) with the liquid, then allowing this to vaporize into the circulating system of the long path cell. This also gave a concentration of about 2 p.p.m. and was quite reproducible. The densities of the liquids were estimated to be 1.2 grams per ml. since they sink in water but float on concentrated potassium iodide solution. Molecular weights were taken. This technique was successful for PPN and PBN but a single attempt to apply it to PAN failed because the sample exploded while being vaporized into the cell. For PPN both techniques were applied and satisfactory agreement was obtained. A mixture of PAN in nitrogen was found to contain 7230 p.p.m. by diluting 100- or 200-ml. samples into the long path cell. A 10-cm. gas cell was then flushed with this mixture at atmospheric pressure and the complete spectrum (3 to 15 microns) recorded using a Perkin-Elmer double grating spectrophotometer at a slit program of 10.00. The absorptivities were in good agreement with those obtained at 120 meters. The absorptivities of PPN and PBN measured in the 10-cm. cell were calculated assuming the value at 12.58 microns to be the same as that found at 120-meter path. Because of its lower vapor pressure the PBN spectrum was weaker than the others and therefore somewhat less accurate.##

05286

J. P. Devlin, and I. C. Hisatsune

UREY-BRADLEY POTENTIAL CONSTANTS IN NITROSYL AND NITRYL HALIDES. Spectrochim. Acta. 17, 206-17, 1961.

The Urey-Bradley force field has been used to calculate the vibrational force constants in NOF, NOCl, NOBr, NO2F and NO2Cl. Refined force constants using harmonic frequencies of NOCl and NO2 molecules containing isotopic nitrogen atoms have also been evaluated. The transfer of Urey-Bradley force constants from N2O4 and NOX ro NO2X yielded reasonably good results except for the N - F stretching mode in NO2F. For the nitryl fluoride a possible change in assignment is suggested from the present calculations. (Author abstract) ##

C5288

I. C. Hisatsune, and K. H. Rhee

THE INFRARED SPECTRUM OF N2O3. (In: Advances in Molecular Spectroscopy.) Proc. Fourth Intern. Meeting of Molecular Spectroscopy, 1959. 3, 989-98, 1962.

The infrared spectrum of a mixture of N2O3 and N2O4 was studied in the liquid phase from 2 to 25 microns and in the solid phase from 2 to 35 microns, both at low temperatures. By comparing this spectrum with that of pure N2O4 in the same phases, absorption bands belonging to N2O3 were identified. A tentative assignment of all but three of the fundamental vibrations in N2O3 is presented. (Author abstract) ##

05289

I. C. Hisatsune, J. P. Devlin, and p8y. vv8ada

INFRARED SPECTRA OF SOME UNSTABLE ISOMERS OF N2O4 AND N2O3. J. Chem. Phys. 33, (3) 714-9, Sept. 1960.

The temperature dependence of the infrared spectra of N2O4 and N2O3 in the solid phase at liquid-nitrogen temperatures has been investigated. From these spectra of both 14N and 15N isotopic molecules, absorption bands which may be assigned to unstable isomers of these nitrogen oxides have been identified. A reasonable interpretation of these absorption bands can be made by assuming the existence of two unstable forms of N2O4 and one of N2O3. (Author abstract) ##

05302

A. Levy and E. L. Merryman

SO3 FORMATION IN H2S FLAMES. J. Eng. Power 87, (4) 374-8, Oct. 1965. (Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, New York City, Nov. 29-Dec. 3, 1964.)

The microstructure of H2S-O2 flames was developed in terms of composition and temperature profiles. With the aid of these profiles, rates of formation of SO2 and SO3 are reported and discussed. With the aid of kinetics and thermodynamic data developed for the principal reaction steps, it is shown that a major part of the SO3-problem may be related to the O-atom oxidation of SO2 in the flame. These fundamental studies of thermochemical reactions provide the basic information needed as the next step in understanding how reactions in flames and on surfaces affect external corrosion and deposits in boiler furnaces. (Author abstract)##

05325

Iong, R.

FORMATION OF POLYCYCLIC AROMATIC HYDROCARBONS DURING INCOMPLETE COMBUSTION. (Progress Rept. Oct. 1, 1964-Mar. 31, 1967). Birmingham Univ., England. (Mar. 1967). 37 pp.

This report comprises three parts: Part I: discusses the development of a rapid analytical method for polycyclic aromatic hydrocarbons in soots. Extraction with CHCL3 was followed by column chromatography and then by programmed temperature gas chromatography, with UV spectrophotometry. Certain polycyclic aromatics thus identified, have not been reported hitherto in the literature on soots from hydrocarbon flames. Investigations were made on diffusion flames in which various concentrations of O2 in O2-N2 and O2-Ar mixtures as oxidant were used. In other experiments oxygen and other additives were introduced into the fuel supply. The effects on the formation of total soot, carbonaceous residue, CHCL3 soluble material and polycyclic aromatics are discussed. Part II: An investigation was made of the concentrations of stable species in the pyrolysis zone and particularly in the luminous zone of propane and ethylene diffusion flames burning on a Wolfhard-Parker type of burner. The effects of O2, H2 and C2H2 as additives to the fuel and of O2 and N2 to the air stream were examined. Results showed that the sooting rate is related to the C2H2 present in the luminous zone for the C2H4 flames. Part III: An investigation was made of the polycyclic aromatic hydrocarbons associated with the soot in pre-mixed C2H2-O2 flames operating at 20 mm. Hg. On the assumption that the concentration of polycyclic aromatics in the soots collected at increasing heights in the flame represents the state of affairs in the flame, it appears that the polycyclic aromatics are formed principally in a lower temperature region of the flame than that corresponding to "carbon" formation. Results also indicate that C2H2 is important in carbon formation in C2H4 and C3H8-air diffusion flames. (Author summary modified)

05333

Purcell, T. C. and I. R. Cohen

PHOTO-OXIDATION OF HYDROCARBONS IN THE PRESENCE OF ALIPHATIC KETONES. Atmos. Environ., 1(6):689-692, Nov. 1967. 16 refs.

Products of photooxidation reactions involving ketone-hydrocarbon mixtures are reported. Reaction mixtures were prepared in plastic bags fabricated from fluorinated ethylene-propylene plastics. The containers were irradiated by fluorescent lamps with intensity maximum at 3100 A. The ketones and/or hydrocarbon mixtures consisted of: acetone, acetone-2-methyl-1-butene, and diethyl ketone. The percentage conversions, after 1,2, and 3 hours of irradiation, of 2-methyl-butene-1 and acetone as a function of ratio of ketone to olefin showed that the acetone conversion is essentially constant, whereas olefin conversions increase with increasing ratio. Extrapolation of zero ratios of ketone to olefin indicates an inexplainable background reaction at longer conversion times. As with the aldehyde-olefin systems, the rate of consumption of olefin increased at longer reaction times. The ketone conversion rates are virtually constant. Past oxidants such as ozone or peroxy acid were not detected. Alkyl hydroperoxide was identified as a slow oxidant product. The portion of these products due to the ketone photooxidation and that due to the olefin has not yet been determined. A mechanism often cited to explain the photooxidation of ketones involves a free-radical scheme.##

05351

Cole, B. and Shulman, H. L.

THE ADSORPTION OF SULFUR DIOXIDE BY DRY ION EXCHANGE RESINS. Clarkson Coll. of Technology, Potsdam, N. Y., Dept. of Chemical Engineering. 1960. 19 pp. (Published in part in Ind. Eng. Chem. 52, (10) 859, Oct. 1960.)

Adsorption-equilibrium data were obtained for the adsorption of sulfur dioxide from air-sulfur dioxide mixtures onto dry ion exchange resins. The resins are shown to compare favorably with those adsorbents in commercial use with regard to their adsorptive capacity-temperature characteristics. Isosteric heats of adsorption are tabulated. Isotherms and characteristic curves representing the equilibrium data are presented. (Author abstract)

05378

Kimura, K. K. Kimotsuki, O. Tada, and K. Nakaaki

ON THE ATMOSPHERIC OXIDATION OF SULFUR DIOXIDE. Rodo Kagatu J. Sci. Labour, Tokyo. 41 (10), 501-11, 1965. Jap. (Tr.)

Basic studies were conducted on the behavior of SO2 which is most

representative of gaseous atmospheric pollutants, and the effect of atmospheric conditions were followed. The first study was to follow the time changes in the decrease in SO2 concentration within a sealed container especially with respect to the rate of air flow, humidity, or presence of particulate matter. It was found that high air circulating rate or high humidity increased the rate of decrease in SO2 concentration. This rate also was greater when particulate matter was present than when there was none. This means that the oxidation of SO2 is favored by high circulating rate, high humidity, or the presence of particulate matter. Qualitative and quantitative tests were conducted on the formation of sulfuric acid by the atmospheric oxidation of SO2 or by the reaction of SO2 with other gases present in the atmosphere. A known concentration of SO2 was generated into a 27 cu m chamber, and the H2SO4 mist generated was analysed. This was followed by studies of the reactions between SO2 and other gases in 20 l and 5 l reaction bottles under fixed conditions, and the products of these gaseous reactions were analyzed. The results verified the production of H2SO4 from SO2. It was found that there was much greater production of H2SO4 from SO2 when other gases such as NO2, ozone, or H2O2 were present rather than SO2 alone. The H2SO4 mist produced from SO2 was observed under a microscope, and it was verified that liquid droplets (H2SO4) were being formed in the atmosphere. It was found that the presence of particulate matter greatly accelerated H2SO4 production. It was found that the atmosphere of an urban area also contains particles similar to the mist formed in the experiments. This was verified by electron microscopy. (Author summary)

05423

Benson, S. W. and G. R. Haugen

THE MECHANISM OF THE HIGH-TEMPERATURE REACTIONS BETWEEN C2H2 AND HYDROGEN. J. Phys. Chem., 71(13):4404-4411, Dec. 1967. 24 refs.

The observed high-temperature rates of isotope exchange between C2H2 and D2 have been interpreted in terms of a radical mechanism. The chain propagation steps for the system are D + C2H2 yields C2HD + H and H + D2 yields D + HD. The lower temperature addition kinetics to form C2H4 are fitted very well by a related chain with the same initiation and termination but a different propagation. The theoretical steady- state rate expression, derived from the radical mechanism, adequately predicts the observed rates at temperatures greater than 1400 deg K. The problem of attainment of steady state during the short time interval of the experiment and the catalytic effect of traces of oxygen and organic impurities on the induction period are discussed. (Authors' abstract, modified) ##

05425

Shaw, R., F. R. Cruickshank, and S. W. Benson

THE REACTION OF NITRIC OXIDE WITH 1,3- AND 1,4-CYCLOHEXANDIENES. J. Phys. Chem., 71(13):4538-4543 Dec. 1967. 16 refs.

The gas-phase reactions of nitric oxide with 1,3- and 1,4-cyclohexadiene have been studied in a Pyrex reaction vessel between 306 and 359 deg. Initial pressures were varied: 1,3-CH, 3-57 torr; 1,4-CH, 10-71 torr; and NO, 64-436 torr. No pressure change could be detected. Products identified by gas chromatography and mass spectrometry were water, nitroux oxide, benzene, and traces (about 10% of the benzene) of cyclohexene. Good mass balances were obtained for the hydrocarbons, but the water analyses were erratic and the nitrous oxide was less than given by the stoichiometric equation. The rate of production of benzene was unaffected by increasing the surface to volume ratio 20 times and was first order in cyclohexadiene and nitric oxide. The rate-determining step is given. (Authors' abstract, modified) **

C5491

Stephens, E. R.

THE FORMATION OF MOLECULAR OXYGEN BY ALKALINE HYDROLYSIS OF PEROXYACETYL NITRATE. Atmos. Environ. 1, 19-20, 1967.

Alkaline hydrolysis of peroxyacetyl nitrate (PAN) vapor was found to produce molecular oxygen in mole for mole yield. This accounts for the oxygen which was missing in the hydrolysis experiments of Nicksic, Harkins and Mueller. The hydrolysis equation

05611

S. W. Nicksic, J. Harkins, and B. A. Fries

A RADIOTRACER STUDY OF THE PRODUCTION OF FORMALDEHYDE IN THE PHOTO-OXIDATION OF ETHYLENE IN THE ATMOSPHERE (PART II--THE EFFECT OF OTHER COMPOUNDS ON YIELD AND CONVERSION). J. Air Pollution Control Assoc. 14, (6) 224-8, June 1964.

In this study, the tracer procedure was used to study some aspects of the effect of composition of the irradiated mixture on the amount of formaldehyde produced from ethylene, the latter being the dominant olefin in auto exhaust. The irradiation chamber contained oxidants, NO2, CH2O, hydrocarbons and aerosols. Oxidant, nitrogen dioxide, and aerosols were measured in order to obtain a more complete monitoring record of the reaction. Chemical formaldehyde and radiochemical formaldehyde measurements together with gas chromatographic determination of hydrocarbons, were used to establish yields and conversion. Results showed: (1) Ethylene gives more formaldehyde in the presence of oxygenates and certain aromatics because the reactions are faster; the fraction converted, however, remains constant. The quantitative aspects of the effect of oxygenates remain to be studied. (2) Formaldehyde yield from ethylene irradiated alone depends on the nitric oxide-hydrocarbon ratio. (3) In the presence of other olefins, the nitric oxide dependency is much less. (4) Production of formaldehyde from ethylene is not influenced by other olefins

except for the nitric oxide effect. In reference to changing composition of exhaust, oxygenates can be expected to increase formaldehyde formed during photo-oxidations, but it is not yet possible to state how big the effect might be. The removal of olefins will probably affect formaldehyde production in proportion to the extent of removal. Removal of other olefins will not affect the reactions of ethylene per se except for the nitric oxide-hydrocarbon ratio effect.##

05613

Levine, M., W. F. Hamilton, and E. Simon

ATMOSPHERIC PHOTOCHEMICAL REACTIONS OF HALOGENS AND BUTYL HALIDES. J. Air Pollution Control Assoc., 14(6):220-223, June 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Assoc., Detroit, Mich., June 9-13, 1963.)

This investigation was oriented toward delineation of the interactions involved in the chemical inhibition of smog exhibited by iodine and to a much lesser extent by the other halogens. Apparatus used for handling and irradiating polluted atmospheric air was a 500 cu ft chamber enclosed by a "Mylar" polyester film 1 ml thick. The chamber is mounted on large casters allowing positioning of the unit for optimum sunlight exposure. When thermal (dark) reactions are studied, the entire chamber is rolled into a large, light tight, thermostatically controlled oven. Other details concerning the laboratory procedure are given. The results of these tests show that neither temperature, over the range of about 100 to 200 F, nor sunlight greatly influences the reaction ratio of O3 with iodine 2, and that sunlight has a much greater effect on the reaction rates of the halogens with O3 than does temperature. The qualitative rates of halogen-ozone reactions in purified air in sunlight are iodine 2 greater than Br2 greater than Cl2. The effectiveness of iodine 2 in reducing O3 in a smoggy atmosphere is enhanced over its effect on O3 in purified air, whereas the effectiveness of Br2 and Cl2 in quenching smog O3 is diminished. The effectiveness of Br2 in reducing O3 is inhibited by the presence of both saturated and unsaturated hydrocarbons, whereas the iodine 2 - O3 reaction is unaffected.##

05628

E. Briner, W. Pfeiffer, and G. Malet

A CONTRIBUTION TO THE STUDY OF PEROXIDATION OF NITROGEN OXIDE-III (THE INCREASE IN THE SPEED OF NITROGEN OXIDE PEROXIDATION AT VERY LOW TEMPERATURES). J. Chim. Phys. (Paris) (Translated as JPRS R-8527-D.) 21, 25-44 (1924). Fr. (Tr.)

The process of peroxidation of nitrogen oxide, whose speed increases as the reaction temperature drops, is a purely chemical

process in flat contradiction with the general rule that the speed of a reaction increases with the rise in temperature. A systematic study of this phenomenon, measuring the reaction speed at increasingly low temperatures was conducted. By means of suitable apparatus and operating methods, the process of peroxidation over a temperature range from plus 75 deg. to minus 190 deg., was observed. For various temperatures within that range, the absolute constants of speed as well as the temperature coefficients were determined. To show clearly the influence of temperature as it occurs in practice on nitrous gases, whose composition is generally given in percentages of NO by volume, the values for the relative constants and the half-reaction times for various temperatures above and below 0 deg were calculated. The half-reaction times are particularly interesting to consider, since because of the formation of N2O3 they indicate good conditions for recovering nitrous mixtures. To bring out the effect of refrigeration at minus 183 deg. and for a mixture containing 1% NO in air, a mixture about the same as the gas from an arc furnace, the half-reaction time is 58 times shorter than at ordinary temperatures. Intense refrigeration of the nitrous gases will thus make it possible to reduce the volume of oxidation chambers by very large proportions.##

05641

A. Goetz, O. Preining, and T. Kallai

THE METASTABILITY OF NATURAL AND URBAN AEROSOLS. Geofis. Pura Appl. (Milano) 50, (3) 67-80, 1961.

The principle of the sampling method of submicron aerosols with the Aerosol Spectrometer is briefly described and the analytic procedures for deriving the frequency-size distribution from photo-micrographic particle counts and microphotometric light scattering measurements of identical areas of the particle deposit. After initial analysis the deposits were exposed to elevated temperature (80 C) for several hours and re-analyzed. Four representative aerosol types, originating from the high sea, the shore, vegetation, and metropolitan smog are analyzed in this manner for the range (0.2 micron = to or less than d = to or less than 1.3 microns). All show a very marked decrease, even disappearance of the smaller particles d less than 0.5 micron) and shrinkage of the larger particles (d less than 1 micron). By far the largest effect is observed for the smog aerosols. This volatility appears to be caused by either evaporation of the particle substance or by the gradual oxidation of its organic components into more volatile products (CO2, H2O). (Authors' summary)##

05643L

H. H. Reamer

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION. Preprint. 1966.

During the period covered by this report, primary effort was in the investigation of the effect of the fuel employed upon the characteristic perturbations and the residual quantities of the oxides of nitrogen. The experimental conditions encountered in connection with the investigation of the behavior of the propane-air and the n-butane-air system are given. The average reaction pressure was approximately 41 p.s.i.a. The composition of the products of reaction for the ethane-air, propane-air, n-butane-air and natural gas-air systems are tabulated. All the measurements involving natural gas-air, ethane-air, propane-air and n-butane-air, were carried out at a stoichiometric mixture ratio of approximately 0.93. Variation in the perturbations of normal stress and the frequency, as a function of the molecular weight of the fuel are reported. The quantities of residual oxides of nitrogen increased rapidly with an increase in molecular wt from that of the natural gas-air system to that of the ethane-air system and progressively increased with further increases in molecular wt. to propane and n-butane. On the other hand, the perturbations in the double amplitude of the normal stress decreased progressively with an increase in molecular wt. of the fuel. Phase relationships between the upper and lower ports were almost exactly 180 degrees. The frequency was approximately 509 cycles per sec in the case of the natural gas-air system. An increase to 521 cycles per sec was found for the ethane-air system and a small decrease to 518 and 516 cycles per sec for the propane-air and the n-butane-air systems respectively was observed. The analysis of the perturbations in normal stress obtained in connection with the propane-air and ethane-air systems is included. It is apparent, as in the case of the ethane-air system, that a phase relationship slightly reater than 180 degrees exists between the upper and lower ports, again confirming that the primary nature of the perturbations involved a longitudinal wave.##

05824

L. G. Wayne

ON THE MECHANISM OF PHOTO-OXIDATION IN SMOG. Preprint. (Presented at the Joint Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5, 1961).

The action of sunlight on urban atmospheres contaminated with auto exhausts promotes oxidation of hydrocarbons and NO and eventual accumulation of O3. Some very intriguing problems of chemical mechanisms are presented by these reactions. It is the purpose of this paper to subject to an elementary kinetic analysis some of the proposed reaction schemes and to introduce a mechanism which shows promise of explaining certain features of the photooxidation process. Experiments have established that the oxidant material is mainly O3. The various hydrocarbons present in automobile exhaust disappear at different rates; olefins in general react more rapidly than paraffins, and most olefins react more rapidly than ethylene, which is the predominant olefin in auto exhaust. Relevant information available from experiments involving the irradiation of synthetic atmospheres containing low concentrations of hydrocarbons and oxides of nitrogen has presented reasoning

leading to the conclusion that react chains are very probably involved in these systems. Briefly, the reasoning is that, since NO2 is the only likely primary absorber of actinic light products, hydrocarbons are probably involved by reaction with the oxygen atoms produced in the photolysis of NO2; but since the rate of accumulation of products is sometimes faster than the estimated rate of reaction between hydrocarbon molecules and oxygen atoms, each appropriate oxygen atom collision must lead to several subsequent steps, i.e., to a chain of reactions. Such a chain might promote the conversion of NO to NO2 in either of two ways: by direct consumption of NO, or by consumption of molecular oxygen to form O3. Kinetic implications of chain mechanisms of 3 different types of examined: (1) A mechanism offered by Saltzman, in which chains are initiated by free radicals formed in a hydrogen abstraction reaction by oxygen atoms; (2) A scheme suggested by Leighton incorporating some suggestion of Schuck and Doyle; (3) A new hypothetical mechanism, serving to illustrate the possible consequences of a chain-branching step. Further study, particularly of the relative rates of photooxidation of nitric oxide and olefins in systems with very little nitrogen dioxide, should provide evidence bearing on the importance of branching chains in the urban photochemical smog system.##

05849

N. A. Renzetti and G. J. Doyle

THE CHEMICAL NATURE OF THE PARTICULATE IN IRRADIATED AUTOMOBILE EXHAUST. J. Air Pollution Control Assoc. 8 (4), 293-6 (Feb. 1959).

The Los Angeles smog is characterized by its several manifestations namely, eye irritation, crop damage, r[illegible]d visibility, and high ozone concentrations. Since automobile exhaust is the major contributor to the pollution of the Los Angeles atmosphere, its relation to all aspects of smog formation is of prime importance. There have been three studies of the chemical nature of the particulate in non-irradiated auto exhaust. This is believed to be the first report on the nature of photochemically generated aerosol in auto exhaust. All of the aerosol collected for the chemical analyses was generated under similar conditions. The irradiated chamber was first flushed with pure air and then auto exhaust at 5000 or 7200 ppm by volume was allowed to enter the chamber after passing through the inlet filter. As soon as steady state concentrations were reached, the chamber irradiation lamps were turned on. The experiments were dynamic in nature with 1-hr residence time for the mixture in the chamber during which period the irradiation took place. The aerosol under study was that generated essentially in a stirred flow reactor. The runs lasted up to 9 hr in order to collect samples of sufficient size for the standard microanalytical techniques to be used in the analyses. Microcombustion technique, microanalytical chemical techniques and infrared absorption spectrum measurements are reported. Irradiated auto exhaust appears to be the principal source of nitrate, sulfate, lead, and organic compounds in the particulate matter of Los Angeles smog.

Further, these findings explain the higher values of nitrate and sulfate found in Los Angeles and other similar West Coast cities in comparison with other cities. Assuming six million gallons of gasoline are consumed in auto engines per day in Los Angeles, about one ton per day of non-irradiated particulate and at least 10 tons per day of photochemically generated particulate are present in a typical smog.##

05904

Rebbert, R. E. and Slagg, N.

PRIMARY PROCESSES IN THE PHOTOCHEMICAL DECOMPOSITION OF NITROALKANES. Bull. Soc. Chim. Belges (Brussels) (71) 709-21, 1962.

The present work includes a detailed investigation of the gas and liquid phase photolyses of nitromethane and nitroethane. The main purposes were to determine the primary process or processes occurring for both compounds and to investigate secondary reactions. Nitromethane and nitroethane were photolyzed in the liquid and gaseous phases in order to distinguish the various possible primary processes occurring for each compound. In the case of nitromethane, a free radical split was postulated to account for the products as CH3NO2 + hv = CH3 + NO2. For nitroethane, there are at least two primary processes occurring, namely C2H5NO2 + hv = C2H4 + HONO = C2H5 + NO2. Various secondary reactions are discussed for both compounds.

06068

S. W. Nicksic, J. Harkins, and P. K. Mueller

SOME ANALYSES FOR PAN AND STUDIES OF ITS STRUCTURE. Atmospheric Environ. 1(1):11-18 (1967).

The methods described by the author previously (Methods for Measuring the Concentration and Studying the Structure of Compound X in Synthetic Preparations, presented at the 7th Conference on Methods in Air Pollution Studies, Los Angeles, California, January 25-26, 1965) were used to obtain structural information on this compound. Alkaline hydrolysis, NMR studies, and neutron activation analyses for oxygen content were used. The quantitative conversion of PAN to nitrite and acetate by alkaline hydrolysis suggested that the compound was the mixed anhydride of nitrous acid and acetic acid, but the oxygen content was much too high to support this structure. PAN is sufficiently stable at ambient conditions in carbon tetrachloride and benzene to permit a study of its reactions in solution. The quantitative conversion of PAN in the presence of sodium hydroxide to acetate ion and nitrite ion must mean either that the compound contains the nitrite group or that the nitrite is in some way formed accompanied by the evoluation of oxygen. Direct oxygen analyses performed to data indicate that the molecule contains at least 5 atoms of oxygen, but the data do not preclude the possibility of still higher oxygen content. Perhaps a

relationship between PAN and nitrogen trioxide exists since the latter is known to dissolve in alkalis with complete conversion to nitrite (Sidgwick, The Chemical Elements and their Compounds, Volume I, p 688, Clarendon Press, Oxford, 1950). The two-fold activity in depressing the freezing point of benzene and the conversion to methylacetate in the presence of sodium hydroxide require further study. Nuclear magnetic resonance provides a convenient and direct observation of the solution chemistry of this unusual molecule.##

06102

N. Endow, G. J. Doyle, and J. I. Jones

THE NATURE OF SOME MODEL PHOTOCHEMICAL AEROSOLS. J. Air Pollution Control Assoc. 13 (4), 141-7 (Apr. 1963). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

To obtain greater knowledge of the chemical nature of that part of smog which reduces visibiligy, its significance to health and its formation in model aerosols were generated by the photo-oxidation of a single hydrocarbon, by nitrogen oxides and, in most instances, by the co-photooxidation of a third component-sulfur dioxide. The model aerosols are the result of the same type of process which undoubtedly takes place in the atmosphere, but the complexity of the reactions is considerably reduced and the chemical composition is more closely controlled. Evidence from infrared spectra of precipitated model aerosols formed by the photo-oxidation of lower olefin homologs-nitrogen oxides-sulfur dioxide mixtures at 50% relative humidity indicated that the principal constituent of the aerosol was sulfuric acid. Other analytical data, microchemical elemental analysis, spot tests, and the like, gave support to the belief that the principal constituent of these aerosols was sulfuric acid. In addition to sulfuric acid, the aerosols contained a smaller concentration of nitrite-type material. Weight loss studies of precipitated aerosols indicated either that portions of the condensed aerosol materials were volatile or that the aerosol was unstable and a decomposition product was volatile.##

06189

Liu, B.Y.H. K. T. Whitby, and H.H.S. Yu

ON THE THEORY OF CHARGING OF AEROSOL PARTICLES BY UNIPOLAR IONS IN THE ABSENCE OF AN APPLIED ELECTRIC FIELD. J. Colloid Interface Sci. 23 (3), 367-78 (Mar. 1967).

The charging of aerosol particles by unipolar ions in a gaseous medium and in the absence of an applied electric field has been analyzed from the standpoint of the kinetic theory. The result has been compared and found to show good agreement with the experimental data, when the mean thermal speed of the corona ions

used in the charging experiments is taken as 1.18 X 10,000 cm./sec. This is equivalent to assuming a value of 460 for the molecular weight of the ions. The molecular weight thus determined and the measured mobility of the ions of 1.1 sq. cm./volt-sec. at atmospheric pressure both tend to support the view that the corona ions used in the charging experiments are molecular clusters formed by the interaction of the charge and dipole moment of the molecules in the cluster. However, the exact nature of these molecular clusters could not be determined from the measurements made. The experimental data show that the charging process is unaffected by the mean free path of the ions and hence by pressure. This is in agreement with the result of the theoretical analysis based upon the method of kinetic theory of gases and is in variance with theories based upon the macroscopic diffusion of ions. It has also been shown that the predicted increase in the particle charging rate in Murphy's analysis is entirely the result of neglecting the curvature of the free path of ions in the vicinity of a charged particle. The correct equation, taking into account the curvature of the ion free path, agrees with an equation first derived by White. The failure of the theories based upon the solution of the continuous steady-state diffusion equation to account for the experimental facts has been shown to be due to the low concentration of ions normally encountered in any aerosol charging process and the essentially discontinuous nature of the charging process. (Authors' conclusions)

C6236

Goetz, A.

THE SYNTHETIC PRODUCTION OF AEROCOLLOIDS AND THEIR QUANTITATIVE EVALUATION. Proc. Nat. Cof. Aerosols, 1st, Liblice, 1962. (1964). pp. 153-68.

The experimental efforts towards an understanding of the basic processes which cause the formation of aerosols indicate that these reactions cannot easily be studied in quantitative detail under static conditions in large exposure chambers. It appears preferable to use for detailed studies of such reactions a continuous, dynamically steady flow to which the various reagent components are added, and which is sampled at various defined reaction stages. The reliability of many such dynamic procedures depends on the degree to which the physical conditions of the flow system and the reaction kinetics therein can be kept constant over extended test period. The method and instrumentation described in this paper intended to overcome these difficulties, in particular to facilitate the systematic study of synergistic effects in aerocolloidal systems.

06320

E. S. Fishburne, D. M. Bergbauer, R. Edse

THE CATALOYTIC DECOMPOSITION OF NITROUS OXIDE AND THE THERMAL DECOMPOSITION OF NITROGEN DIOXIDE. Ohio State Univ., Columbus, Aeronautical and Astronautical Research Labs.

(Aug. 1965). 35 pp. (Rept. ARL 65-169.) (Contract AF 33(657-8951.) (Project 7065.)
CFSTI, DDC: AD 622692

The reaction between atomic oxygen and N2O has been studied at temperatures ranging from 1500 to 2100 K. The atomic oxygen in this study was generated by either the thermal decomposition of NO2 or the thermal decomposition of ozone. To determine the amount of atomic oxygen released in the thermal decomposition of NO2 it was necessary to study this decomposition in detail. This study was conducted also at temperatures ranging from 1500 to 2000 K and over a wide range of concentrations and pressures. The reaction rates obtained for the various steps in the decomposition of NO2 are in general agreement with those obtained by other investigators. The reaction of nitrous oxide in the presence of NO2 with Ar as the diluent was studied to determine if the oxygen released in the decomposition of NO2 would accelerate the decomposition of N2O. No noticable acceleration was observed. Many experiments were conducted with a N2O mole fraction of 0.02 and 03 mole fractions varying between 0.005 and 0.06. In these experiments the diluent was molecular oxygen. The presence of atomic oxygen definitely produced an increase in the rate of decomposition of N2O. It is found that the reaction between atomic oxygen and N2O is pressure dependent. It is shown that the different rate constants obtained by other investigators may be reasonably explained on the basis of a pressure dependent step in the reaction mechanism. (Author abstract)##

06418

C. Orr

THE INFLUENCE OF ELECTROSTATIC EFFECTS ON THE DISPERSION OF POWDERS. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-116.)

The objective of this study is to relate the electrostatic charging characteristics of powders upon dispersion to the stability of the resulting aerosol. Present information does not conclusively establish to what extent electrostatic charging enhances or degrades the dispersion of a powder and whether or not the resulting aerosol is more or less stable. Tests designed to measure the frictional charging characteristics of powders relative to ambient conditions are discussed. An apparatus was devised in which pwders could be made to slide across solid surfaces, indicating the charging developed. The presence of certain gases (SO2, CO2, NO2) altered the charging of a number of powders. The influence of NO2 was particularly evident. Its effect was purely physical in many cases, for evacuating a powder restored its original charging characteristics. Various powders and mixtures of powders are being dispersed into an aerosol chamber with the charge generated upon dispersion and the decay rate of the aerosol being

measured. The most interesting effect uncovered so far, although it should not be unexpected, is that two powders that normally charge due to frictional effects with opposite sign will produce no net charging when mixed in the proper proportion.##

C6473L

Bonner, B. H.

REACTION RATE DATA FOR SOME NITROGEN/OXYGEN SPECIES. Rocket Propulsion Establishment, Westcott, England, RPE-TM-425, 24p., 1966.
DDC: AD808585

Reaction rate data for sixteen gas phase reactions involving species composed of nitrogen and oxygen are presented. The sources of the data presented in each table are given as references, together with brief indications how the data were obtained.

C6477

N. F. Carleton

STUDIES OF METASTABLE MOLECULES OF ATMOSPHERIC INTEREST (FINAL REPT. JUNE 1, 1964-AUG. 31,1966). Smithsonian Astrophysical Observatory, Cambridge, Mass. (Oct. 1966). 52 pp. (Rept. No. AFCRL-66-717.)
CFSTI, DDC: AD 642 851

The work described in this report has focused on the study of metastable states of atoms and molecules of atmospheric interest. The technique was to form a thermal molecular beam and produce metastables in the beam by electron bombardment. The metastables drifted along with the beam, and were observed to decay in flight, to collide with other molecules in a low pressure gas cell, and to strike metal surfaces (with subsequent ejection of electrons). The following observations were made: (1) N2 metastables excite the gamma bands of No with a rate of about 1% of the momentum-transfer collision rate, populating only low vibrational levels. (2) A long-lived 02 metastable state around 10.8 ev reported by others apparently does not exist (but rather belongs to impurities in the 02). (3) Long-lived metastable molecules can effuse directly from a region containing a short duration (a few msec) afterglow of N2 and (4) Excited N2 molecules can maintain their excitation after collision with a teflon surface, with a reflection coefficient of 40% + or- 20%. A theoretical estimate of the mode of decay of long-lived metastables shows that electric dipole radiation resulting from spin-orbit coupling will almost always dominate magnetic quadrupole radiation. (Author abstract modified)

06612

R. Penndorf

MIE SCATTERING COEFFICIENTS FOR SELECTED AEROSOL SIZE DISTRIBUTIONS (FINAL REPT. APR. 1, 1964 - OCT. 31, 1965). AVCO Corp., Wilmington, Mass., Research and Development Div. (Rept. Nos. RAD-TR-65-39 and AFCRL-65-836.) (Oct. 31, 1965). 17 pp.

Formulas are derived for volume scattering coefficients applicable to aerosols. Different types of size distribution for the aerosol, such as normal distribution, log-normal distribution, and exponential distribution, are assumed. Nominal results obtained by the author and those published in the literature are given and discussed. The volume scattering coefficients become smooth functions. The size distribution is very wide. Hence, simpler mathematical formulation can be used than those obtained from the exact Mie theory. However, only the number of aerosol particles can be obtained from an evaluation of experimental data, but details of the size distribution cannot be extracted from experimental data. (Author's abstract) ##

06646

G. Porter and P. Suppan

PRIMARY PHOTCHEMICAL PROCESSES IN AROMATIC MOLECULES. (PART 14. COMPARATIVE PHOTOCHEMISTRY OF AROMATIC CARBONYL COMPOUNDS). Trans. Faraday Soc., (528), 3375-83, Dec. 1966.

Quantum yields of photoreduction are correlated with spectroscopically determined energy levels of lowest singlet and triplet states for a range of aromatic carbonyl compounds. The interpretation of reactivity in terms of electron density distribution in the excited states, which was given earlier for benzophenone derivatives, is equally applicable to benzaldehydes, acetophenones, and to carbonyl derivatives of naphthalene and anthracene. The photochemistry of these compounds depends only on the nature of the lowest triplet state, or the lowest singlet state if intersystem crossing is not efficient (in the anthracene derivatives and in ortho-, hydroxy- and amino-compounds). Both the hydrogen-abstraction and the double-bond addition processes involve essentially the approach of a negative charge towards the carbonyl oxygen. If the oxygen atom is negatively charged, there will be an energy barrier increase from the n--pi* state to I--Pi* states and become greater with increasing CT character of these states.##

06698

R. W. Hurn, E. Dimitriades, and R. D. Fleming

HOW HYDROCARBON TYPES DETERMINE SMOG-FORMING POTENTIAL OF EXHAUST GASES. S.A.E. (Soc. Automot. Engng.) J. 74 (2), 59-61 (Feb. 1966).

Relationships between automobile exhaust gas reactivity under irradiation and composition of unburned hydrocarbons in the exhaust was studied over a wide range of fuels and driving conditions. Indices measured were: rate at which NO is converted to NO2; oxidant formation; and formaldehyde formation. These were correlated with concentrations of; unsaturates plus oxygenates; non-aromatic unsaturates plus oxygenates; and non-aromatic unsaturates plus oxygenates, less acetylene and propylene. Correlation between composition and chemical reactivity is not consistent. Oxidant formation is constant within experimental error limits. Variability in the rate of NO2 formation is considered to be due to variations in composition, including variations in molecular weight, within each of the general classifications with which reactivity correspondence was sought. Inherently low precision of the analytical method may be at fault for the + or - 34% scatter shown in formaldehyde-formation data. For exhaust samples of similar origin (that is, the same fuel), a fairly well defined correlation exists between reactivity and composition. Extracting all or part of the unsaturates and oxygenates from exhaust samples does tend to reduce their reactivity. Nitrogen oxides also play a complex role in determining reactivity. In a hydrocarbon-nitrogen oxides mixture, reactivity is more or less a monotonic function of the hydrocarbon concentration, but its dependence on nitrogen oxides is not monotonic. Comparing the reactivity of two exhaust samples , therefore, means taking account not only of reactive hydrocarbon concentrations, but also their ratios to nitrogen oxides, as well as the direction in which the hydrocarbon to nitrogen oxides ratio affects reactivity.##

06719

Harkness, A. C. and F. E. Murray

GAS PHASE OXIDATION OF METHYL MERCAPTAN. Intern. J. Air Water Pollution, Vol. 10, p. 245-251, 1966. 8 refs.

The reaction between methyl mercaptan and oxygen in the gas phase has been examined in the temperature range 201 to 275 C. Sulfur dioxide is the chief product of the reaction, being formed together with methane at the start of the reaction. Other products of the reaction are carbon monoxide, carbon dioxide, hydrogen, formaldehyde and methanol. In the presence of excess oxygen, complete conversion to sulfur dioxide is obtained quickly at 275 C. At lower temperatures and lower oxygen content much of the sulfur remains unaccounted for. In confirmation of previous work the rate of reaction was found to be strongly accelerated by oxygen and to be inhibited by mercaptan.##

06720

A. J. Fatiadi

EFFECTS OF TEMPERATURE AND OF ULTRAVIOLET RADIATION ON PYRENE ADSORBED ON GARDEN SOIL. Environ. Sci. Technol. 1 (7), 570-2 (July 1967).

Irradiation of pyrene adsorbed on garden soil for 240 hrs at 32 degrees gave a mixture of products that could be separated by thin-layer and column chromatography. Eight compounds were formed, and five have been identified: 1,1'-bipyrene, 1,6- and 1,8-pyrenediones, and 1,6- and 1,8-pyrenediols. When the pyrene adsorbed on garden soil was stirred in the dark for 240 hrs at 32 degrees, the yield of 1,1'-bipyrene was lowered (from 4 to 6%) to 0.3%, and only traces of the two diones were formed; on treatment in the dark at 110 degrees for only 8 hrs, dione yields were increased to 2.5%. When other particulates (silica gel, alumina, Florisil, etc.) were used instead of garden soil, 1,1'-bipyrene was not formed. Experiments in which radical-capture agents were incorporated showed lower yields of 1,1'-bipyrene, indicating that the reaction with ultraviolet irradiation involves a free-radical mechanism. The yield of the diones was unchanged with these agents present, suggesting that they are formed by attack of adsorbed oxygen on photo-excited pyrene molecules. Irradiation of pyrene in the crystalline form without soil did not produce 1,1'bipyrene. No attempt was made to follow quantitatively the input of energy during the irradiation of pyrene on soil (a heterogeneous reaction); from the practical standpoint, however, the main objective of this study was to trace the fate of pyrene on soil, as a representative reaction of a series of polycyclic, aromatic hydrocarbons (carcinogenic and non-carcinogenic). (Author abstract) ##

06954

H. S. Johnston, G. E. Mcgraw, T. T. Paukert, L. W. Richards, and J. Van Den Bogaerde

MOLECULAR-MODULATION SPECTROMETRY I. NEW METHOD FOR OBSERVING INFRARED SPECTRA OF FREE RADICALS. Proc. Nat'l Academy Sci., US 57 (5), 1146-53 (May 1967).

In complex chemical reactions involving three or more free radical intermediates, it is impossible to deduce a unique mechanism merely by chemical analysis of all products and reactants. The most promising source of information is spectroscopic observation of the free radical intermediates. The flash photolysis method obtains infrared spectra, producing high concentrations of the intermediate radicals by subjecting the parent gas to a short intense pulse of energy. There are limitations to this method which are improved upon by the molecular modulation technique. Here the photolyzing light is turned off and on continually, modulating slightly the concentration of the reactants, intermediates, and products. When the concentration of a chemical species is varied periodically, absorption which is due to this species is used to modulate a transmitted infrared beam intensity. Thus when scanning through the spectrum, the light intensity is modulated only when one passes through that region characteristic of a particular reaction member. This method gives the vibrational spectra and the lifetime of the radical. ##

C6980

A. J. Fatiadi

SEPARATION OF PYRENEDIONES BY COLUMN CHROMATOGRAPHY. J. Chromatog. 20, 319-24 (1965).

Pure 1,6 - 1,8 and 4,5 pyrenediones were needed as reference compounds in connection with studies on the photochemical oxidation of pyrene. The procedure reported by Vollmann for the preparation and separation of 1,6 and 1,8 pyrenediones involves a laborious series of processes. After tests with a variety of adsorbents and solvents, it was found that 1,6 and 1,8 pyrenediones, in an oxidation mixture obtained from purene, are separated directly on a column of silica gel with glacial acetic acid as an eluate. The final purification of 1,6 pyrenedione was accomplished on a column of activated alumina with benzene as a solvent. The composition of each eluted fraction was checked by thin layer chromatography. The infrared and UV spectra of the purified diones and of 1-0x0-6,7 phenalenedicarboxylic acid anhydride were recorded.##

07082

Johnstone, H. F. and A. J. Roll

AIR POLLUTION . . . FORMATION OF SULFURIC ACID IN FOGS. Ind. Eng. Chem., 52(10):861-863, Oct. 1960. 15 refs. (Presented at the 136th Meeting, Div. of Water and Wastes, Atlantic City, N.J., Sept. 1959.)

The formation of sulfuric acid from dilute sulfur dioxide in the presence of artificial fogs nucleated by small particles of manganese and iron salts was studied. The effects of the presence of inert salt nuclei and of inhibitors in air along with the catalytic nuclei on the rate of reaction and formation of the acid when relative humidity of air is below saturation, but above the critical value at which saturated solutions of the salts exist were also noted. Laboratory experiments with artificial fogs formed in controlled atmospheres show that oxidation of sulfur dioxide in air at concentrations corresponding to those in combustion gases diluted 10 to 1000 times takes place rapidly when catalytic nuclei are present. Concentrations of acid up to 50 mg per cubic meter are formed in a few minutes. High concentrations of inert nuclei decrease rate of formation, but do not stop the reaction. The fastest rate is with catalytic aerosol at relative humidities just below 100%.##

07085

Sharp, J. H., T. Kuwana, A. Osborne, and J. N. Pitts, Jr.

SOME ELECTRON SPIN RESONANCE STUDIES ON ULTRAVIOLET IRRADIATED

SOLUTIONS OF ANTHRAQUINONE AND BENZOPHENONE. Reprinted from Chem. Ind., P. 508-509, March 17, 1962. 9 refs.

Elucidation of the photo-chemical reduction mechanisms of anthraquinone and benzophenone in alcohol solutions has led to the investigation of possible free radical intermediates or products by electron spin resonance (E.S.R.) methods. A free radical anion was produced photochemically at room temperatures by irradiating a solution of 0.0006 M anthraquinone in lithium hydroxide methanol. The overall band width of the E.S.R. signal was 11.0 gauss. Definite configurational proton assignments could not be made. In neutral solutions of methanol at room temperatures the irradiation of anthraquinone did not produce an E.S.R. signal. When the temperature was lowered to minus 190 deg C. a broad singlet was obtained with no hyperfine structure. The signal disappeared when the sample was warmed to minus 150 deg C. At low temperatures the "reactivity" of the radical is lessened. In the photochemical reduction of benzophenone to benzpinacol, the irradiation of a degassed solution of benzophenone in isopropyl alcohol gives rise to an "intermediate" species with an absorption maximum at ca.330 to 3400A. An attempt was made to detect this "intermediate" by E.S.R. The benzophenone solution was irradiated for various intervals of time. After each irradiation, the solution was examined by both ultraviolet and E.S.R. spectrometry . In no case was an E.S.R. signal obtained. However, when the temperature was lowered to minus 150 deg C. and solution was irradiated directly in the cavity of the instrument, a resonance was observed, which disappeared rapidly at minus 100 deg C. The E.S.R. spectrum for the isopropanol radical was not observed, although it may be masked by the broad ban. It can be seen in certain photosensitised systems irradiated at low temperatures. Further work is in progress toward elucidating the intermediate(s) present in the photolysis of benzophenone.##

07108

Renzetti, N. A. and G. J. Doyle

PHOTOCHEMICAL AEROSOL FORMATION IN SULFUR DIOXIDE-HYDROCARBON SYSTEMS. Intern. J. Air Water Pollution, 2:327-345, June 1960. 31 refs. (Presented at the Int. Clean Air Conf., London, Engl., Oct. 20-24, 1959.)

A series of photochemical experiments were conducted in a 50-l. stirred-flow reactor to study aerosol formation from different hydrocarbons in the presence of nitrogen oxides and sulfur dioxide. Irradiation by simulated sunlight of trace concentrations (p.p.m.) of the reactants, in some cases yielded particles in the size regime 0.1-0.3 microns diameter, which by scattering of light are important to visibility in the atmosphere. A large number of experiments with 3 p.p.m. of various hydrocarbons, 1 p.p.m. nitrogen oxides, and 0.1 to 0.5 p.p.m. SO2 indicated that the olefinic hydrocarbons were the only important aerosol formers in contrast to the paraffinic and aromatic hydrocarbons. It was observed that the photolysis of sulfur dioxide proceeds at the rate of 0.4 per cent per minute.

The high sulfate content of the particulate matter and low gaseous sulfur dioxide concentrations observed in the Los Angeles smog are consistent with the findings of this laboratory program. (Authors' summary, modified)##

07445

J. B. Mudd, T. T. McManus

PRODUCTS OF THE REACTION OF PEROXYACETYL NITRATE WITH SULFHYDRYL COMPOUNDS. Preprint, California Univ., Riverside, Dept. of Biochemistry and Statewide Air Pollution Research Center, ((14)) p. 1967.

The proportion of oxidation and acetylation of sulfhydryl groups by peroxyacetyl nitrate was investigated. The compounds chosen for study were glutathione, coenzyme A, and reduced pancreatic ribonuclease. It was expected that these studies would elucidate the mechanism of toxicity of the peroxyacyl nitrates found in polluted urban atmospheres. Peroxyacetyl nitrate reacts with reduced glutathione producing equimolar amounts of oxidized glutathione and S-acetyl glutathione. Reaction of peroxyacetyl nitrate with reduced coenzyme A results in the formation of coenzyme A disulfide, accounting for 30-40% of the reacted sulfhydryl. The remaining products can be separated by ion exchange chromatography and are probably higher oxidation states. There is no evidence of formation of S-acetyl coenzyme A. The distribution of products obtained by treatment of coenzyme A with peroxyacetyl nitrate is similar to that obtained by treatment with hydrogen peroxide. Treatment of proteins with peroxyacetyl nitrate has not provided any evidence of acetylation of sulfhydryl groups. The formation of intramolecular disulfides by treatment of reduced ribonuclease with peroxyacetyl nitrate is apparent. No evidence was obtained in favor of intermolecular disulfide bonds.##

07450

Sage, B. H.
PARTIAL OXIDATION PRODUCTS FORMED FURING COMBUSTION(

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION (SEVENTEENTH PROGRESS REPORT: JANUARY 1 TO JUNE 30, 1967). Preprint, California Inst. of Tech., Pasadena, Chemical Engineering Lab., ((31))p., 1967.

The monochromator and collimator employed in the atmospheric combustor, reported under the 15th progress report have been adapted to the pressure combustor. Results obtained after changes are reported. Tables and diagrams are presented.##

07458

Benson, S. W. and G. R. Haugen

MECHANISMS FOR SOME HIGH-TEMPERATURE GAS-PHASE REACTIONS OF ETHYLENE, ACETYLENE, AND BUTADIENE. J. Phys. Chem., 71(6):1735-1746, May 1967.

Sufficient information concerning the rate parameters of the individual propagation and termination steps of radical reactions now exists so that it is possible to predict the kinetic behavior of a chain mechanism with better than order-of-magnitude reliability. This precision comes from the similarities that exist between the A factors and activation energies of homologous reactions. In particular, the creditability of a proposed chain mechanism for the high-temperature gas-phase reaction of unsaturated hydrocarbons can be tested by comparing the observed kinetic behavior with that predicted by the mechanism. A pyrolytic chain was proposed that adequately describes the experimentally observed high-temperature hydrogenation of acetylene and also the high-temperature pyrolysis of ethylene. The propagation steps representing the formation of the major products of these systems are diagrammed. The minor product in both systems is 1,3-butadiene. In the pyrolysis of ethylene, the side reaction accounts for the production of butadiene. In the case of the hydrogenation of acetylene, a concurrent chain is responsible for the side products. (Authors' abstract, modified)##

07463

Harrison, Arthur P., Jr., and Vivian E. Raabe

FACTORS INFLUENCING THE PHOTODYNAMIC ACTION OF BENZO A PYRENE ON ESCHERICHIA COLI. J. Bacteriol., 93(2):618-626, Feb. 1968. 23 refs.

Death of Escherichia coli resulted when a buffer suspension was exposed simultaneously to colloidal benzo a pyrene (BP) and 355-millimicrons illumination. Neither hydrocarbon nor illumination alone caused death; oxygen had to be present. The survival curve had a shoulder, and then death proceeded exponentially with time. Death rate was independent of temperature between 6 and 32 C. The duration of the shoulder, however, decreased slightly with increase in temperature. The shoulder was not due to delay in BP entering the cell. Death was influenced by the composition of the medium in which the cells were grown prior to illumination. The amount of BP bound to the cells was determined after three ethyl alcohol-ether extractions. Appreciable binding occurred in the presence of 355-millimicrons illumination with air, and relatively little binding occurred under nitrogen; very little binding occurred in the dark with nitrogen or air. At the outset, rate of binding under illumination with air was not temperature-dependent, but with time it became strongly temperature-dependent. Binding under illumination with nitrogen was temperature-independent. Bound BP was associated primarily with cell protein. Cells in growth medium resisted death and

BP binding. At 21 and 32 C, deoxyribonucleic acid damage occurred during exponential death. No damage was detected at 21 and 32 C in the dark with BP, under illumination in absence of BP, or under illumination with BP in a nitrogen atmosphere. (Authors' abstract)##

07488

Sekigawa, T.

IONS IN AIR (I). Text in Japanese. Kuki Seijo (Clean air - J. Japan Air Cleaning Assoc., Tokyo), 3(2):26-30, 1965. 12 refs.

Ion size distribution, ion production, ion distribution, ionization equilibrium, and annihilation of ions are discussed. Ions can be extremely large, as in the case of snow or raindrops, or very small like charged molecules. In the distribution curve by Junge, ions greater than 0.00001 cm (0.1 micron) follow the "inverse triple ratio law". In this paper, only small ions are covered, i.e. those produced by electrolytic dissociation of radioactive materials, cosmic rays, ultraviolet rays, short wave radiation, separation of liquids, and corona discharge. Small ions are created when a single electron attaches itself to a molecule. The mobility of positive ions is 0.9 to 1.7 sq. cm./V sec. In the atmosphere near the surface of the earth, there are more positive ions than negative, with a ratio of about 1.1 to 1.2. In clean atmosphere there usually are from 300 to 1000 positive small ions per cc. and from 200 to 800 negative small ions per cc. The positive ion and radioactive aerosol concentrations in clean and polluted air are compared in a table. The hourly variation in ion concentration is graphed indicating that the medium size ion has a peak around 1 P.M. The number of ions present varies because of recombination of positive and negative ions or attachment to other particles. When the production and annihilation of ions are balanced, the ionization equilibrium state is reached.##

07495

Ciborowski, J. and H. Pohorecki

THE EFFECT OF ELECTRICAL DISCHARGES ON SUBLIMATION CONDENSATION. Int. Chem. Eng., 7(1):4859, Jan. 1967. 46 refs. Translated from Chem. Stosowana, Vol. 2B, p. 159-182, 1966.

The effect of electrical discharges on the condensation of vapor at temperatures below the triple point has been studied. A simplified schematic diagram of the apparatus used is presented. It was composed basically of a saturator, a heater, a superheater, an ionizer, and a condensation chamber. The condensation was carried out by mixing a hot stream of gas containing vapors of the condensing component (naphthalene) with a stream of cold inert gas. It was concluded that: the existence of a considerable effect of electrical discharges on the course of sublimation condensation has been established. This effect is based primarily on

intensification and simultaneous stabilization of the course of the progress. The effect of discharges on the condensation process depends on the type of discharge. This effect is considerable in the case of spark discharges, but in the case of corona discharges it was not observed at all. The magnitude of the effect observed depends to a small degree on the voltage (if it is large enough for spark discharges to occur). This magnitude also depends on the thermodynamic parameters of the system; however, no dependence on the flow rate of the gas through the ionizer was observed (within the investigated limits of changes of this value). The effects of electrical discharges on the condensation process can be explained by the formation of a larger number of active condensation nuclei, which facilitate nucleation of the new phase.##

C7498

Hughes, A. N., M. D. Scheer, and R. Klein

THE REACTION BETWEEN O(3P) AND CONDENSED OLEFINS BELOW 100 DEG K. J. Phys. Chem., 70(3):798-805, March 1966.

The addition of oxygen atoms to condensed simple olefins has been studied in the 77 to 90 deg K temperature range. The ground-state O(3P) atoms were generated in the gas by dissociation of O2 on rhenium or tungsten surfaces heated to 2300 deg K. At 90 deg K and oxygen pressures below 40 mtorr, the major products were found to be the unfragmented epoxides and carbonyls. Above 50 mtorr, ozonides and oxygenated products characteristic of rupture at the double bond were observed. Above 100 mtorr only the ozonides and their fragments were produced. At 77 deg K, the ozonolysis reaction occurred at much lower oxygen pressures. Comparison of these results with those obtained in the gas phase at 300 deg K indicates that the low-temperature environment efficiently removes the excess energy from the excited biradical formed in the primary act of O atom addition to the double bond. In all cases studied, fragmentation was less extensive than the comparable gas phase process. (Authors' abstract)##

07499

Johnston, H. S. and F. Cramarossa

HIGHLY COMPLEX PHOTOCHEMICAL MECHANISMS. Advance. Photochem., Vol. 4, p. 1-24, 1966. 16 refs.

In a kinetic or photochemical system involving three or more free-radical intermediates, one can never deduce the mechanism by any method that merely analyzes for all the final products and the reactants. The reason for this indeterminacy is very straightforward: there are simply more elementary reactions than

observed products. The Beer-Lambert law, properties of odd and even numbers, and simple differential and integrated rate equations are utilized in the interpretation of data for highly complex photochemical systems. In the photolysis of propionaldehyde the molecular split occurs to some extent, but the principal mode of decomposition is into two radicals. Radical-radical reactions are of two kinds, recombination and disproportionation. For the recombination, there are six reactions and six different products. For the disproportionations, there are nine reactions but only six products (one of which is the reactant). Each of the products is produced by three different reactions; thus a kinetic study based on analysis of products alone will never characterize any of the reactions. Notations for expressing the number of reactions, products and radicals, the rate of destruction of radicals, half-time of radicals, rate of radical-reactant reaction, rate of destruction of reactant, and the rate of radical-radical and radical-molecule reactions are determined. A photochemical reaction may involve a chain reaction, or products may be formed almost entirely from radical-radical reactions. Chain reactions are favored by high reactant concentration, low light intensities, and large rate constants for radical-molecule reactions (high temperature, low activation energy). At a given light intensity and reactant concentration, a reaction might be non-chain at low temperature and a chain reaction with substantially different products at high temperature. Typically, photochemists report quantum yield, the ratio of molecules of products formed to photons absorbed. This taking of ratios throws away the absolute value of the light absorption rate. A photochemical reaction involving three or more radicals may be simplified by careful selection of light intensity, reactant pressures, or temperature. Three cases are considered: Photolysis of Acetaldehyde, Photolysis of Acetone, and Photooxidation of Acetone. In the photolysis of acetone, simplification has been achieved but in the photoxidation of acetone such simplification seems to be out of sight.##

07500

Johnston, Harold D., and Julian Heicklen

PHOTOCHEMICAL OXIDATIONS. III. ACETONE. J. Am. Chem. Soc., Vol. 86, p. 4249-4254, Oct. 20, 1964.

The room-temperature photooxidation of acetone (0.25 to 17 mm.) in oxygen (0.09 to 9.7 mm) with continuous ultraviolet radiation above 2200 A. has been tudied. Observations were made by leaking the reaction mixture directly into the electron beam of the mass spectrometer during photolysis. The principal products of the reaction were H2CO, H2O, CH3OH, and CH3OOH; minor products were CH3COOH, HCOOH, CH3OOCH3, and higher molecular weight products which were probably CH3COCHO and CH3COCH2OH. Because of the cracking pattern of the reactants, it was impossible to establish the presence or absence of CH4, CO, CH2CO, and CO2. From the identified products at least 14 free radicals are inferred to be intermediates in this system. An exhaustive and impartial examination of all possible

radical-radical disproportionation and recombination reactions indicates that the data exclude a large number of possible reactions but that 140 reactions could still be occurring. Formaldehyde, so far as these studies go, could be formed by 39 different reactions. Thus, this experimental method cannot give a complete mechanism, nor can any method that simply analyzes all molecular products. (Authors' abstract, modified)##

07505

Mudd, J. B.

BIOCHEMICAL EFFECTS OF AIR POLLUTANT OXIDANTS (PROGRESS REPORT SEPTEMBER 1, 1965-AUGUST 11, 1967). Calif. Univ., Riverside, (26)p., Aug. 11, 1967. 24 refs.

In order to better define the toxicity of ozone, its reactions with amino acids and proteins were studied under conditions closely approximating physiological conditions, that is, in aqueous buffered solutions. Ozone was generated by passing oxygen through an apparatus producing a silent electric discharge. Solutions of amino acids and proteins were exposed to ozone by permitting the gas to bubble through the solutions from a capillary tip. The following order of susceptibility of amino acids to oxidation by ozone was found: cysteine, methionine, tryptophan, tyrosine, histidine, cystine, and phenylalanine. The oxidations of tyrosine and histidine were dependent on pH, being greater under alkaline conditions. The oxidation of pancreatic ribonuclease by ozone resulted in a decrease in enzymic activity. The amino acid residues most affected by treatment with ozone were tyrosine and histidine. Reaction of avidin with ozone caused changes in the absorbance spectrum characteristic of the tryptophan residues. The biotin binding capacity of avidin was lost after treatment of avidin with ozone. The studies reported herein cannot be used to predict the effect of ozone on lipoprotein membranes, and it remains for direct experiment to ascertain whether the lipid or the protein of biological membranes is first damaged by ozone. (Author's summary, modified)##

07510

Schneider, Ronald A. and Jerrold Meinwald

PHOTOCHEMICAL REACTIONS OF ALPHA, BETA-UNSATURATED CARBONYL COMPOUNDS WITH OLEFINS. J. Am. Chem. Soc., 89(9):2023-2032, April 26, 1967.

The synthesis of trans-5,5,6-trimethyl-3,6-heptadien-2-one is described. Upon irradiation, it is converted into the cis isomer which undergoes two modes of intramolecular cycloaddition to form 1,4,7,7-tetramethyl-3-oxabicyclo(4.1.0)hept-4-ene and 1,3,6,6-tetramethyl-2-oxabicyclo(3.1.1)hept-3-ene. The cycloadditions are considered to proceed through a diradical intermediate formed from s-cis. It is suggested that s-cis or s-trans conformational preference may be an important factor in determining the mode of photo-reaction of alpha beta-unsaturated

carbonyl compounds with olefins. The s-trans-1-acetylcyclohexene was found to react with isobutylene to form cis-1-acetyl-2-methylallycyclohexane without side reactions. Several s-cis enones were found to be photochemically reactive. Some general rules are presented which summarize existing observations for this class of reactions.##

07512

Slater, David H., Susan S. Collier, and Jack G. Calvert

THE PHOTOLYSIS OF 1,1'-AZOISOBUTANE VAPOR AT 3660 A; THE REACTIONS OF THE ISOBUTYL FREE RADICAL. Preprint, Ohio State Univ., Columbus, Evans Chem. Lab., (25) p., (1967). (Presented at the Robert Livingston Photochem. Symposium, Minneapolis, Minn., May 9, 1967 and 154th Nat. Meeting, Amer. Chem. Soc., Chicago, Ill., Sept. 1967.)

The vapor phase photolysis of 1,1'-azoisobutane was studied in experiments at wavelength 3660 A and at various temperatures and pressures. The product rate data fit well the suggested reaction scheme involving an excited azoisobutane molecule and reactions of the isobutyl free radical. The ratio of rate constants for the disproportionation and combination reactions of the isobutyl radical was estimated to be 0.075 plus or minus 0.007 (25-168 deg). Rate constants for the H-atom abstraction and the decomposition reactions of the isobutyl radical were derived. From the effects of pressure and temperature on the quantum yield of nitrogen, an estimate was obtained for the rate constant for the excited azo-molecule decomposition reaction. If the excited singlet were the reactant, then fluorescence emission should be observable from the azoisobutane. No emission was detectable even in experiments at -180 deg.##

07513

Siedlewski, J. and S. Trawinski

THE MECHANISM OF CATALYTIC OXIDATION ON ACTIVATED CARBON. VIII. THE RELATIONSHIP BETWEEN THE CONCENTRATION OF FREE RADICALS OF CARBON AND ITS CATALYTIC ACTIVITY IN THE OXIDATION OF H2S AND SO2. Text in Polish. Roczniki Chem., No. 6, p. 1083-1090, 1966. 18 refs. Engl. transl. Intern. Chem. Engl., 7(1):35-39, Jan. 1967.

The concentration of free radicals in carbons obtained as a result of the carbonization of organic substances depends on the carbonization temperature. A maximum number is obtained in the temperature range of 550-700 deg. depending on the type of substance carbonized. The number reaches 10 to the 20th power free radicals per gram. At a temperature of about 1200 deg their number diminishes by two orders of magnitude. The catalytic activity of semiconductors, which include low-temperature carbons (obtained at temperatures below 900 deg), depends on among others, the crystal structure and the electric conductivity. In the range of temperatures in which there is a variation of the

concentrations of free radicals in low-temperature carbons, the crystal structure and the electric conductivity vary simultaneously. The catalytic activity of those carbons can depend on the variation of both of these parameters. The oxidation of H2S and SO2 on samples of carbon obtained as a result of carbonization of saccharose at a temperature of 1200 deg and of activation with oxygen at temperatures of 450 deg and 850 deg indicates that those carbons had a similar crystal structure, the same electric conductivity, and identical concentrations of free radicals. They differed only in the number of superficial oxides formed on their surfaces as a result of chemical activation by oxygen. The purpose of the present work was to find the connection between the concentration of free radicals in carbon and its catalytic activity in the oxidation og H2S and SO2. The number of micromoles of oxidation product forming per sq. m of surface of the carbon in a specific time is taken as a measure of catalytic activity. The heating of carbon with previously formed free radicals causes a reduction in the number of radical active centers on the surface and a decline of its activity in the oxidation of H2S and SO2.##

07517

Wong, Edgar L., Andrew E. Potter, Jr., and Frank E. Belles

REACTION RATES OF CARBON MONOXIDE WITH HYDROXYL RADICALS AND OXYGEN ATOMS. National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center. NASA Tech. Note. TN D-4162, 18 p., Sept. 1967. 28 refs.
CFSTI

A mass spectrometer stirred reactor technique was used to measure the rates of reaction of carbon monoxide with hydroxyl radicals and with oxygen atoms. For the carbon monoxide and hydroxyl reaction in the temperature range of 310 deg to 611 deg K, the rate constant based on CO2 production was 4.2 plus or minus 0.8 x 10 to the 11th power exp (-1200 plus or minus 300/RT) cubic centimeters per mole per second. The rate near room temperature is lower than other values reported recently. The activation energy of 1200 calories per mole (5000 J/mole) is in good agreement with recent estimates. For the carbon monoxide and oxygen reaction, an upper limit value for its rate constant based on CO2 production was estimated to be 4 x 10 to the 13th power cubic centimeters squared per mole squared per second at 500 deg K. Since the carbon monoxide and hydroxyl reaction is considerably faster than the carbon monoxide and oxygen reaction, trace impurities giving rise to hydroxyl interfere with carbon monoxide and oxygen rate measurements, and may be responsible for the large differences in rate constants reported by various investigators for this reaction.##

07607

Stein, K. C., J. J. Feenan, G. P. Thompson, J. F. Schultz, L. J. E. Hofer, and R. B. Anderson

THE OXIDATION OF HYDROCARBONS ON SIMPLE OXIDE CATALYSTS. J. Air Pollution Control Assoc., 10(4):275-281, Aug. 1960. 2 refs. (Presented at the 52nd Annual Meeting, Air Pollution Control Assoc., Los Angeles, Calif., June 21-26, 1959.)

A large number of catalysts have been laboratory tested for the oxidation of various hydrocarbons for the purpose of developing catalysts which may be suitable for oxidizing hydrocarbons in automobile exhaust gas. A large number of catalysts were tested using the rapid microcatalytic- chromatographic technique. A group of eight hydrocarbons was selected for study, comprising n-pentane, isopentane, pentene-2, pentyne-1, n-hexane, cyclohexane, 2,3 - dimethylbutane, and benzene. Many oxides of some of the metals of groups IB, VB, VIB, VIIB, and VIII of the periodic table were selected. A list selected from the oxides used, together with their B.E.T. surface areas and x-ray diffraction data is shown in Table I. Results show that: branched hydrocarbons are more difficult to oxidize than normal hydrocarbons; ease of oxidation increases with molecular weight in homologous series; unsaturated aliphatic hydrocarbons are more easily oxidized than the corresponding paraffins; in comparing open chain and cyclic compounds having the same number of carbon atoms, reactivity toward oxidation probably decreases according to the sequence; the most active single oxide catalysts were found to be the oxides of cobalt, nickel, manganese, chromium, cerium, titanium, and iron. It is conceivable that different forms or preparations of the same oxide would have different activities. The microcatalytic - chromatographic technique has proved to be a very convenient means for rapid screening in oxidation studies. It is to be recommended where a large number of catalysts or reactants are to be investigated or where a wide range of temperatures is to be used.

07620

Suter, H. R.

RANGE OF APPLICABILITY OF CATALYTIC FUME BURNERS. J. Air Pollution Control Assoc., 5(3):173-175, 184, Nov. 1955. (Presented at the 48th Annual Meeting, Air Pollution Control Assoc., Detroit, Mich., May 22-26, 1955.)

A more detailed exposition of the mechanism of vapor-phase catalytic oxidation is presented. Catalytic oxidation proceeds through 3 steps: adsorption on the active surface; chemical reaction; and, desorption. During adsorption turbulence will assist in the diffusion process and shapes of catalyst supports promoting laminar flow should be avoided. The clearance between active surfaces should be small. The general field of applicability for vapor-phase oxidation in the air pollution control field lies in streams containing combustible matter at concentrations below the lower limit of explosibility. The limitations may be physical, chemical, or practical and economic. Noncombustible inorganic solids are not affected by the catalyst, and should be absent from the stream lest they accumulate and cover the active surface. The material to be oxidized must yield innocuous products in order to serve the purposes of air pollution control. Specific catalyst

poisons must be absent. Catalytic oxidation units are not bought "off-the-shelf" but are specially designed for various applications.

07681

Fontijn, Arthur and Daniel E. Fosner

NO + O CHEMILUMINESCENT REACTION USING ADIABATICALLY EXPANDED NITRIC OXIDE. Virginia Univ., Charlcttesville, Dept. of No. NR- -,,Technical Rept. No. AC-6-P, 7p., Jan. 1967. 18 refs.
CFSTI, DDC: AD 647978

The rate constant for the chemiluminescent reaction NO + O yields NO2 + hv has recently been observed from upper-atmospheric chemical releases and simulated releases in a low-density wind tunnel to be several orders of magnitude higher for adiabatically expanded than for "normal" NO. In this note, it is shown that this enhancement can be attributed to the presence of clustered NO based on super saturation calculations and recent mass spectrometric gas-sampling data. These clusters allow the normal three-body excitation step to be replaced by a two-body step for which the observed rate constant is shown to be quite reasonable. (Authors" abstract, modified)

07717

Heicklen, Julian and Norman Cohen

THE ROLE OF NITRIC OXIDE IN PHOTOCHEMISTRY. Aerospace Corp., El Segundo, Calif., Contract AF 04 (695)-1001, Rept. SSD-TR-66-190 and TR-1001(2250-40)-4, 301p., Oct. 1966. 464 refs.
DDC: AD 808580

The gas phase chemistry of nitric oxide is reviewed for reactions of importance below about 300 C. Included are reactions of vibrationally and electronically excited NO and the reactions of NO with stable molecules, electronically excited molecules, atoms, ions, and free radicals. The fate of nitroso compounds is also discussed. A bibliography containing 464 references is listed. (Authors" abstract, modified)

07791

Benson, S. W.

MECHANISM OF THE DIELS-ALDER REACTIONS OF BUTADIENE. J. Chem. Phys., 46(12):4920-4926, June 15, 1967.

Kinetic data on the pyrolysis of 1,5-cyclooctadiene to give butadiene and 4-vinyl cyclchexene by parallel paths are analyzed and shcwn to be quantitatively consistent with a ccmmon biradical

precursor, the octadien-2,6,-diyl-1,8 biradical. It is further shown that these data are in excellent agreement with independent studies of the reverse reactions; pyrolysis of 4-vinyl cyclohexene to butadiene and the dimerization of butadiene. A fourth study of the pyrolysis in solution of 1,2-divinyl cyclobutane to give butadiene, 1,5-cyclooctadiene, 4-vinyl cyclohexene, and cis-trans isomerization is shown to fit the same scheme with only minor modifications in two of the rate constants. The analysis lends support to the 12.6-kcal assignment of the allyl stabilization energy. It also resolves an apparent anomaly in the rate parameters for the reverse Diels-Alder pyrolyses of cyclohexene, 3-methyl cyclchexene, and 4-vinyl cyclohexene. Arrhenius parameters for all the elementary rate constants are assigned and shown to be reasonable compared to similar processes. Important rotation-controlled rates in the scheme are examined and conclusions drawn about the contributions of different rotomeric forms of the biradical. (Author"s abstract) ##

07798

Hess, L. D., J. L. Jacobson, K. Schaffner, and J. N. Pitts, Jr.

STRUCTURE AND REACTIVITY IN THE VAPOR-PHASE PHOTOLYSIS OF KETONES. V. ALIPHATIC CYCLOPROPYL AND OLEFINIC KETONES. J. Am. Chem. Soc., 89(15):3684-3688, July 19, 1967. 34 refs.

Vapor-phase irradiations of the aliphatic cyclopropyl and olefinic ketones, methyl cyclopropyl ketone(I), 1-cyclopropyl-2-propanone (II), 1-cyclopropyl-3-butanone (IV), and 1-penten-4-bone (III) at 3120 A and 120 degrees have been carries out. Quantum yields of yields of carbon monoxide from the type I split are 0.04 for ketone I, 0.88 for ketone II, 0.71 for ketone IV and 0.60 for III. Other primary photochemical processes in these ketones are the isomerization of cyclopropane in coumpounds I and II, and the type II split in compound IV. The data from these reactions together with previously reported results provide the basis for a coherent evaluation of the relationship between structure and photoreactivity in the vapor phase at 3130A and 120 degrees of the two series of closely related aliphatic and cyclic ketones which possess cyclopropyl and double bonds, respectively, in the alpha, beta and gamma positions to the carbonyl group. (Authors] abstract, modified)

07806

Alley, F. C.

A BENCH SCALE REACTION SYSTEM FOR MEASURING ATMOSPHERIC SMOG POTENTIAL. Preprint, Clemson Univ., S. C., Chemical Engineering Dept., ((10p.)), 1966. (Presented at the 21st Annual Instrument Society of America Conference & Exhibit, New York City, Oct. 24-27, 1966, Paper No. 11.3-1-66.)

Photochemical smog results when the atmosphere contains certain hydrocarbons and oxides of nitrogen and is irradiated under

favorable conditions of temperature and humidity. If smog control efforts are to be successful, the complex series of reactions by which smog is produced must be completely understood from a standpoint of reaction mechanism and kinetics. This paper describes a bench scale photo-chemical reaction system for simulating the processes occurring when a polluted atmosphere is irradiated by sun light. The flexibility of the system as well as the capabilities and limitations of several existing pollutant monitoring devices are discussed. (Author)s abstract)

C7866

Cohen, Saul G.

EFFECTS OF MERCAPTANS AND DISULFIDES ON PHOTOCHEMICAL AND HIGH ENERGY RADIATION INDUCED REACTIONS. Brandeis Univ., Waltham, Mass., Dept. of Chemistry, Contract No. AT(30-1)2499, 19p., Nov. 1, 1966.
CFSTI: NYO 2499-20

The nature of photochemical and radiation induced reactions and of their retardation and inhibition by mercaptans were studied. The proposed mechanism of inhibition of photochemical and radiation induced reactions by mercaptans involves rapid transfer of hydrogen atom from mercaptan to an intermediate radical and from an intermediate radical to thiyl radical. In the benzophenone-2-propanol system the intermediate radicals, (C6H5)2COH I and (CH3)2COH II are reconverted to the starting materials, benzophenone and 2-propanol respectively, inhibition resulting. This mechanism would require that if these radicals I and II were formed from benznydrol and acetone they would still be converted by the sulfur compounds to benzophenone and 2-propanol. Inhibition would not results but the system would be transformed. This has been demonstrated confirming the mechanism of action of sulfur compounds. Additional experiments have been carried out on the photoreduction of aminobenzophenones in acidic aqueous 2-propanol. Photoreduction at 313 micron of p-dimethylaminobenzophenone in 1:1 2-propanol-water, 6N in HCl, leads to the pinacol with quantum yield of about 0.3 Photoreduction of 4-benzoylphenyltrimethylammonium chloride at 313 m micron in 1:1 2-propanol-water leads to the pinacol with quantum yield of 0.64. Other water soluble ketones are being studied. Preliminary experiments indicate that a tertiary amine is an excellent photoreducing agent for 4-benzoylbenzoic acid in aqueous medium, although the tertiary amine is not very effective in photoreduction of benzophenone in benzene.

C7883

Levy, Arthur, F. L. Merryman, and W. T. Reid

MECHANISMS OF FORMATION OF SULFUR OXIDES IN COMBUSTION. Preprint, Battelle Memorial Inst., Columbus, Ohio, ((42))p., ((1967)). 43 refs. (Presented at the Symposium on Air Pollution Control Through Applied Combustion Science, 16th Annual meeting, American Inst. of Chemical Engineers, New York City, Nov. 26-30, 1967.)

The chemistry of sulfur oxidation processes is reviewed with respect to the kinetics and mechanisms of the various processes involved. Oxidation processes examined are those for sulfur, hydrogen sulfide, carbon disulfide, methyl sulfide, and methyl mercaptan. Detailed examination of the kinetics and mechanism of oxidation of hydrogen sulfide is made based on slow reaction, fast (explosion) reaction, flash photolysis, and flame microstructure studies of hydrogen sulfide-oxygen systems. Special attention is given to the role of the lower oxides, SO and S2O, in developing the mechanisms of SO2 formation. The interaction of SO2 in hydrogen-oxygen explosions and in flame processes and the homogeneous formation of SO3 in flames via the removal of oxygen by SO2 are also reviewed. The slow, pre-explosion reactions of H2S and O2 appear to suggest a process whereby the partial oxidation product SO is produced. This is substantiated in part by the energetics of various pre-explosion studies and by some of the flame kinetics. On the other hand, the role of SO or S2O has not been substantiated in an unqualified manner by any of the investigations to date. Therefore it cannot be stated with certainty whether only one or both species are the precursors to SO2 formation. Understanding the oxidation of the organic sulfur compounds, such as the mercaptans and the sulfides, is sketchy. Different mechanisms are suggested, but the evidence is still fragmentary. he homogeneous O-atom oxidation of SO2 in combustion appears to be well-affired. New laboratory tools, fresh experimental approaches, and inventive thinking will all lead to an even better understanding of the complicated fashion in which sulfur reacts with oxygen.

08056

K. H. Homann

CARBON FORMATION IN PREMIXED FLAMES. Combust. Flame, 11(4):265-286, Aug. 1967. 48 refs.

Certain aspects of gas phase carbon formation in premixed flames are reviewed with the object of stimulating discussion and future work in the field. Among the experimental facts discussed are the appearance of fuel-rich flames, limits of carbon formation, temperature dependence of the limit of carbon formation, pressure dependence of the formation limit and the yield of carbon, hydrocarbon intermediates, reaction products from the pyrolysis of acetylene and benzene, particle formation and growth. There follows a discussion of the route of carbon formation with further comments on the influence of additives and electric fields. (Author's abstract, modified) ##

08105

R. S. Juvet, Jr. R. L. Tanner, J. C. Y. Tsao

PHOTOLYTIC DEGRADATION AS A MEANS OF ORGANIC STRUCTURAL DETERMINATION. J. Gas Chromatog., 5(1):15-21, Jan. 1967. 15 refs.

Difficulty reported by many authors obtaining reproducible results

in inter-laboratory studies using the pyrolysis-gas chromatographic technique prompted an investigation of other, more reproducible, methods of sample decomposition. The method chosen was mercury-sensitized photolytic decomposition because of the simplicity of the experimental technique, the simplicity of the fragmentation patterns, the predictability of the decomposition products, and the availability of ultraviolet light sources in many well-equipped laboratories. This proved to be a particularly fortunate choice since, not only are results highly reproducible, but preliminary work led to the discovery that functional groups present in a sample may be identified by characteristic constants related to the retention of certain irradiation product peaks called homologous peaks and common peaks, eliminating the need for identification of the decomposition products in evaluating the structure of the sample. In this paper, the procedure is discussed in detail and the decomposition product retention parameters are tabulated for aldehydes, ketones, alcohols, esters, and ethers. (Authors' abstract)##

08254

Harkness, A. C. and F. E. Murray

REACTION BETWEEN METHYL SULFIDE AND OXYGEN IN A STATIC SYSTEM. Atmos Environ., 1(4):491-497, July 1967. 3 refs.

Methyl sulfide and oxygen react explosively at temperatures as low as 210 C. At 195 C the non-explosive reaction exhibits an initiation stage and a main stage. The rate of the main stage as determined from pressure-time curves is linearly dependent on initial oxygen pressure but substantially independent on initial methyl sulfide pressure. The extent of the initiation stage is reduced by increase in the oxygen pressure. The chief oxidation products are sulfur dioxide and carbon monoxide. Even with an excess of oxygen not all methyl sulfide reacts. (Authors" abstract)##

08353

Hoare, E. E. and D. A. Whytock

PHOTO-OXIDATION OF DIETHYL KETONE VAPOR. Can. J. Chem. (Ottawa), Vol. 45, p. 2841-2845, 1967. 9 refs.

Results from studies of the photo-oxidation of diethyl ketone are reported. Quantum yields of the products of the reaction of diethyl ketone when photolyzed in the presence of oxygen with eight of 3130A were studied as a function of time at 150 and 100 C. The reaction products were mostly the same as those from the photo-oxidation of methyl ethyl ketone. In addition, propionic acid and ethylene were products at 150 and 100 C, while trace amounts of acetone and methyl ethyl ketone were detected at 150 C. The variety of the reaction products and the absolute values of their quantum yields indicate that the reaction is a complex chain reaction of short length. The primary photolysis split is well established. The chain reaction must be caused by hydrogen abstraction from the ketone molecule by a radical during which two types of 3-pentanonyl radical may be formed.##

08558

Hamming, Walter J.

PHOTOCHEMICAL REACTIVITY OF SOLVENTS. S.A.E. (Soc. Automotive Engrs.), Preprint 670809, 14p., 1967. 5 refs. (Presented at the Aeronautic & Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

Evaluative studies of relative photochemical reactivities of various organic solvents for purposes of emission control are reported. Solvents include olefins, xylenes and other aromatics of comparable weight, toluene, branched ketones, tri- and tetrachloroethylene; benzene, and saturated halogenated hydrocarbons. Criteria used to judge relative photochemical reactivity were mainly eye irritation and ozone formation. Initial judgments based on these standards were also invluenced by aerosol formation, aldehyde production, and effect of test substances on rate of conversion of NO to NO2. The results of the entire study show clearly that xylene is more reactive than toluene and some olefins. However, the latter, as a group, appear to have the greatest photochemical reactivity of all hydrocarbon types. Normal ketones, such as methyl ethyl ketone, are slightly reactive, but branched ketones, such as methyl isobutyl ketone, are somewhat more reactive than their normal isomers. Chlorinated ethylenes, except perchloroethylene, appear to be photochemically active to a degree roughly comparable with branched ketones and toluene. Alcohols and aldehydes are less reactive than toluene; and branched hydrocarbons, cyclic paraffins, and normal paraffins, still less so. Benzene, perchloroethylene, saturated halogenate hydrocarbons and acetone appear virtually unreactive. The results of this study clearly demonstrated that both the quantity of organic solvent emissions in los Angeles County and their overall photochemical reactivity were such that a reduction was necessary. The results of the studies were utilized to construct Rule 66 for the control of organic solvent emissions in los Angeles County.

08572

Sunavala, P. D.

COMPUTATIONS ON INCOMPLETE COMBUSTION J. Mines, Metals Fuels (Calcutta), 15(8):242-244, Aug. 1967.

Incomplete combustion found in the use of equipment such as blast furnaces, cupolas, gas producers and partial oxidation processes for the manufacture of synthesis gas was mathematically analyzed from: (1) CO2 max relations; (2) extension of earlier calculations on complete combustion; and (3) direct elemental balances. The utility of the CO2 max relation arises from the fact that it can be calculated both from the fuel gas as well as the flue gas compositions. Equations for calculating the carbon monoxide content in the flue gases from the carbon dioxide and oxygen analysis are provided in a table. For mixed gas practices in steel plants, the volume ratio of blast furnace gas to coke oven gas, can be evaluated by using CO2 max relations. The direct elemental

balances method employs the development of equations for carbon, hydrogen, oxygen, and nitrogen balances in the fuel gas and the flue gases in terms of the unknown parameters which can be evaluated. The ratio of nm to the third power blast furnace gas to nm to the third power coke oven gas in mixed gas practice can be calculated. Fro the straight combustion of any fuel gas, relations obtained, depending on the carbon, hydrogen and oxygen, as well as the carbon and nitrogen balances, ar e given. Equations are provided for the air/fuel and flue and flue gas/fuel gas ratio by volume, if the hydrogen, oxygen and nitrogen balances are employed.

08620

Schumann, G.

INVESTIGATION OF RADIOACTIVE AEROSOLS. (Unterschungen an radioaktiven Aerosolen.)
Text in German. Chem. Ingr. Tech. (Weinheim), 39(16):966-971, Aug. 25, 1967. 21 refs.

The mathematical relationships involved in the accumulation of radioactive atoms and ions on atmospheric aerosols were derived as a function of their particle size. These calculations should also be useful for non-radioactive atoms and ions of similar particle size. As an expansion of the experiments the accujula*ion of polydispersive room and free air aerosols was examined. A Goetz aerosol spectrometer was used for this purpose. The measurements presented difficulties not encountered with the monodispersive aerosols.

08623

Gentry, J. and J. R. Brock

UNIPOLAR DIFFUSION CHARGING OF SMALL AEROSOL PARTICLES. J. Chem. Phys., 47(1):64-69, July 1, 1967.

A theory for unipolar diffusion chargin of small aerosol particles is developed for the free-molecule and transition regions. The free-molecule theory is, of course, exact within the restrictions imposed on the physical system. The theory for the transition regions is based on the Knudsen iteration solution of a relaxation model of the Boltzmann equation. Insufficient experimental data are available to permit detailed comparison with the developed theories. (Authors' abstract)

08645

Lichtenstein, Stanley

INSIDE AIR POLLUTION--THE VIEW FROM NBS. Ind. Heating, 34(7):1250, 1252, 1254, 1258, 1260, July 1967. Also: Air Eng., 9(11):12-15, Nov. 1967.

Investigations by U.S. Bureau of Standards are finding out what

happens to estimated total of 140 million tons of pollutants fed into atmosphere annually by motor vehicles, industry, power plants, space heating and refuse disposals. Various methods used in studies of air pollution are discussed. Several scientific teams making important contributions to air pollution are listed.

08700

Albright, Lyle F.

COMMERCIAL VAPOR PHASE PROCESSES FOR PARTIAL OXIDATION OF LIGHT PARAFFINS. Chem. Eng., 74(17):165-171, Aug. 14, 1967. 18 refs.

Reactors for the manufacture of oxygenated compounds operate adiabatically - and, for some processes, nonisothermally, while in others isothermally. The operating characteristics for these processes; the methods of reacting, separating, recovering, and recycling the various feed, product and byproduct streams; important features in the design and operation of nonisothermal and isothermal reactor systems are discussed.

08705

Kolsaker, P., and P. S. Bailey

OZONATION OF COMPOUNDS OF THE TYPE AR-CH=CH-G; OZONATION IN METHANOL. Acta Chem. Scand., 21(2):537-546, 1967.

The ozonation of some substituted cinnamic esters and acids and of p-propenyl anisole was carried out in methanol at - 78 deg. and the resulting solutions were subjected to decompositions under neutral, acid, and basic conditions. The yields of decomposition products indicate that a reaction between the initially formed methoxy hydro peroxides and aldehydes takes place to some extent prior to the decomposition. The yield of phenols follows the order migratory aptitudes generally accepted. Acid decomposition gave the highest yield of phenols. Basic decomposition gave only the normal cleavage products, viz. acids and aldehydes. Decomposition paths are discussed. (Author Abstract)

08717

Christian, Larry O.

RADAR CROSS SECTIONS FOR TOTALLY REFLECTING SPHERES. Atmospheric Sciences Lab., White Sands Missile Range, N. Mex., Task 1Vo250016A126, ECOM-5142, 25p., Aug. 1967, 5 refs.
CFSTI, DDC: AD 659327

The backscatter efficiency factors (radar cross section divided by geometrical cross section) for totally reflecting spheres have been calculated using exact Mie theory. The results are

presented both in tabular and graphical form for the size parameter (circumference of sphere divided by wavelength of incident radiation) range from 0.01 to 19.95 in increments of 0.01. Comparison between these theoretical calculations and experimental measurements shows very close agreement (less than or equal to 4.4% difference) in five of seven cases. (Author's abstract)##

C8827

Wei, Kei, Jean-Claude Mani, and J. N. Pitts, Jr.

THE FORMATION OF POLYENIC DIALDEHYDES IN THE PHOTOOXIDATION OF PURE LIQUID BENZEN. J. Am. Chem. Soc., 89(16):4225-4227, Aug. 2, 1967. 14 refs.

The photooxidation of dry, liquid benzene, has been investigated and among the several products that were formed, two polyenic dialdehydes; trans, trans-2,4-hexadienedial (mucondialdehyde, I) and 2,4,6,8,10-dodecapentaenedial, II, were isolated. Unfiltered radiation from a medium-pressure mercury lamp was used to irradiate at room temperature pure, dry, liquid benzene through which oxygen was continuously bubbled. The irradiated benzene was chromatographed twice on silica gel, giving three fractions. The first fraction eluted with an 80:20 pentane-ether solution, contained mucondialdehyde (I). The second fraction, eluted with a 70:30 pentane-ether solution, contained dialdehyde II. Infrared, ultraviolet, and nmr techniques were used to determine the physical and spectroscopic properties of I and II. Confirmatory evidence was obtained by mass spectrometry and by microhydrogenation which, in the case of II, yielded a product identical with an authentic sample of 1,12-dodecanediol. The physical and spectroscopic properties of the products, specifically infrared spectrum comparisons, confirm the all-trans configurations for both compounds. Results suggest that benzene ring opening by oxygen may also be involved.##

C8829

Simonaitis, R., G. W. Cowell and J. N. Pitts, Jr.

PHOTOREDUCTION OF CYCLOPENTANONE AND CYCLOHEXANONE. Tetrahedron Letters, No. 38:3751-3754, 1967. 10 refs.

Quantitative correlations of structure and reactivity in the intermolecular and intramolecular photoreduction (Type II process) of ketones are being intensively investigated. A quantitative comparison of the rates of hydrogen abstraction from isopropyl alcohol by cyclopentanone and cyclohexanone is reported. The method employed is the quenching with isopropyl alcohol(IPA) of the isomerization to the unsaturated aldehydes. Results confirm that most of the isomerization occurs from the triplet state of both compounds. An equation is derived from the reaction mechanism that yields information on the following: (1) The quantum yield of the aldehyde in the absence of IPA, and in the presence of IPA, (2) the lifetime of the excited triplet, and (3) the rate constant for the hydrogen abstraction state. The results are evaluated and correlated.##

08845

Altshuller, A. P., S. L. Kopczynski, W. A. Lonneman, T. L. Becker, and D. Wilson

PHOTOOXIDATION OF PROPYLENE WITH NITROGEN OXIDE IN THE PRESENCE OF SULFUR DIOXIDE. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((10))p., ((1967)). 13 refs.

The photooxidation of 2 ppm of propylene and 0.5 ppm of nitrogen oxide was investigated under dynamic flow conditions with sulfur dioxide present in the reaction mixtures at concentrations from 0.0 to 1.2 ppm. Application of the statistical 't' test showed no significant differences in rates of consumption of propylene and nitrogen oxide or in yields of oxidant, peroxyacetyl nitrate, formaldehyde, and acetaldehyde among tests at the various levels of sulfur dioxide, including zero ppm. Amounts of sulfur dioxide consumed in the reactions ranged from 25 to 60%. Although a sulfur balance was not obtained, appreciable amounts of sulfate were measured as a product of the oxidation of the sulfur dioxide. On the basis of previous investigations, the sulfate is believed to be present as sulfuric acid aerosol. These results suggest that appreciable levels of oxidant may occur in urban atmospheres even when high concentrations of sulfur dioxide are present. (Authors' abstract) ##

08877

Hess, L. D. and J. N. Pitts, Jr.

STRUCTURE AND REACTIVITY IN THE VAPOR-PHASE PHOTOLYSIS OF KETONES. IV. CYCLOPROPYL AND OLEFINIC CYCLIC KETONES. J. Am. Chem. Soc., 89(9):1973-1979, April 26, 1967. 32 refs.

Vapor-phase irradiation of bicyclo((3.1.0))hexan-3-one (I) and 3-cyclopentenone (III) at 3130 and 2380-2654 A results in the formation of carbon monoxide and hydrocarbon products with high quantum efficiencies, phi (sub CO) equals 0.77 and 0.87 for I and II, respectively, under a variety of experimental conditions. The hydrocarbon products from I and 1,4-pentadiene (major), vinylcyclopropane, and 1,3-butadiene, while III gives almost exclusively butadiene (phi (sub CO) equals 0.88) over a wide range of temperatures. In contrast, irradiation of bicyclo((3.1.0))hexan-2-one (II) and 2-cyclopentenone(IV) under identical conditions produces only trace amounts of CO and no detectable hydrocarbons. However, compound II does undergo a photoinduced rearrangement to form 3-methyl-2-cyclopentenone. The cyclopropyl and double-bond groups were found to exhibit similar effects on the modes of photoreactivity of these four cyclic ketones. Either of these groups conjugated with the carbonyl chromophore stabilize the ketone, whereas their location in the homoallylic position greatly facilitates photodecomposition. (Authors" abstract) ##

09030

B. A. Lombos, P. Sauvageau, C. Sandorfy

THE ELECTRONIC SPECTRA OF NORMAL PARAFFIN HYDROCARBONS.
Chem. Phys. Letters (Amsterdam), Vol. 1, p. 42-43, March-April 1967. 3 refs.

The far ultraviolet absorption spectra of the normal paraffin hydrocarbons from C1 to C8 were photoelectrically recorded with a double beam instrument down to 1150 A under 0.2 A resolution. An attempt is made to interpret the spectra in terms of Mulliken's united atom treatment of the excited states of methane and ethane. (Authors' abstract)##

09031

E. A. Lombos, P. Sauvageau, C. Sandorfy

THE FAR-ULTRAVIOLET SPECTRA OF BRANCHED CHAIN PARAFFINS.
Chem. Phys. Letters (Amsterdam), Vol. 1, p. 221-223, 1967.
4 refs.
CFSTI, DDC: AD 661478

The far ultraviolet spectra of gaseous isobutane, isopentane and neopentane were measured up to 1150 angstroms. They are compared to the related normal isomer in each case. A tentative interpretation of the spectra is given. (Authors' abstract)##

09034L

F. M. Page

A STUDY OF THE STABILITY OF GASEOUS NEGATIVE IONS.
(FINAL TECHNICAL REPORT.) Aston Univ., Birmingham, England, Dept. of Chemistry, Contract DA-91-591-EUC-3870, Proj. 2001450B13B, ((136))p., Feb. 1967. 15 refs.
CFSTI: AD 822514

The modes of formation, occurrence, and in particular the stability of gaseous negative ions was determined by the magnetron technique. Included is a description of the apparatus used, the elementary theory of the method, and a comprehensive list of the stabilities of ions studied during the past three years.##

09046

Sage, B. H.

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION.
(EIGHTEENTH PROGRESS REPORT: JULY 1 TO DECEMBER 31, 1967.)
Preprint, California Inst. of Tech., Pasadena, Chemical Engineering Lab., ((65))p., 1967. ((21)) refs.

The modifications in the pressure combustor were found to function satisfactorily and have permitted measurements of both the perturbations in normal stress and the perturbations in total and monochromatic optical intensity.. Experimental activities have been limited primarily to obtaining information concerning the perturbations in total and monochromatic optical intensities utilizing air and natural gas as fuel. Results are presented in several tables.. To more fully explain the behavior in the pressure combustor, a set of routine computer programs to permit the prediction of the composition of the products of reaction for any mixtures of air and any hydrocarbon was completed. The calculations have been carried out for varying rates of heat loss from the combustor. The exit temperature from the combustor was computed in this fashion. It was also computed from the rate of flow of gas through the converging-diverging nozzle at the exit of the combustor.. Rather good agreement was obtained between these widely different means of evaluating the exit temperature. The complicated behavior of the perturbations in normal stress at the two ends of the combustor is depicted. The behavior depicted can be explained by the difference in temperature at the two ends of the combustor and the markedly greater radial temperature distributions near the exit of the combustor. Furthermore, the velocity of wave propagation is somewhat different at the same point in the combustor depending on the direction of propagation as a result of the local momentum velocity of the gases. A manuscript derived from the work upon the oscillatory combustion in the pressure combustor, has been completely reworked. A significant amount of additional experimental information was included. The revised manuscript which covers all of the experimental work that has been completed with the pressure combustor for the air-natural gas system, is appended..##

09077

Warneck, Peter and J. O. Sullivan

REACTIONS OF 1D OXYGEN ATOMS IV. REACTIONS WITH N2O, N2 AND CO2. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967, Part I, preprints. Max-Plank-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 94-112, Sept. 1967. 26 refs.
CFSTI: PB 176466

Ozone quantum yields from mixtures of oxygen with N2O, N2 and CO2, photolyzed at 1470 A, are investigated to determine relative rates of reaction of 1D oxygen atoms with the admixed gases. The data are expressed with respect to the rate of reaction with CO2 for comparison with similar data obtained by Cvetanovic from the photolyses of N2O and NO2. Order of magnitude agreement is observed. (Authors' abstract)##

09078

Cadle, R. D. and F. E. Grahek

PHOTOCHEMISTRY OF THE SYSTEM KETENE-NO-H2. In: International Conference on Photochemistry Held at Munchen, September 6-9,

1967,Part I, Preprints. Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 113-125, Sept. 1967.
CFSTI: PB 176466

Nitric oxide has been found to react rapidly with singlet methylene produced by the photolysis of ketene and possibly also with excited ketene, judging from the ratios ethylene produced/ketene reacted. The presence of nitric oxide prevented the formation of methane and ethane when ketene-NO-H2 mixtures were irradiated at room temperature or 200 C. The products resulting from the presence of nitric oxide were all of low molecular weight, judging from the mass spectra. Eight products were separated using gas chromatography and their mass and infrared spectra determined. Only one, hydrogen cyanide, was definitely identified. (Authors' abstract)

09079

K. F. Preston, R. J. Cvetanovic

THE PHOTOOXIDATION OF BUTENE-1 BY NITROGEN DIOXIDE AT SHORT WAVE-LENGTHS. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967, Part I, Preprints. Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 166-192. Sept. 1967. 17 refs.
CFSTI: PB 176466

The photooxidation of butene-1 by nitrogen dioxide has been studied at 2288 A and at longer wavelengths. From the measured effects of additions of inert and other gases on the product yields it is concluded that 1D2 oxygen atoms participate in the photooxidation at 2288 A. Ground state oxygen atoms, produced by the photodissociation of NO2 and possibly by quenching of O(1D) by the olefin, are also important in the photooxidatiin at 2288 A, and are believed to give rise to practically all of the observed yields of the addition porducts, n-butanal and 1,2 epoxybutane. The indications are that the reaction of O(1D) with butene-1 at total pressures below one atmosphere yields very little stabilized addition product. (Authors" abstract) ##

C9C80

Peter Borrell, P. Cashmore

THE UNSENSITISED ((SIC)) PHOTOLYSIS OF BUT-1-ENE AT 1849 A. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967, Part I, Preprints. Max-Plank-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 193-210, Sept. 1967. 16 refs.
CFSTI: PB 176466

On photolysis at 1849 A, but-1-ene yields 25 hydrocarbon products and a solid polymer. In order to elucidate the

mechanism, the effects of added gases, time, pressure of reactant gas and temperature were investigated. A free radical mechanism is postulated in which there are six primary reactions to account for the products and their relative yields. The two major primary reactions are cleavage of the C-C and C-H bonds in the Beta position to the double bond in a 6:1 ratio. Addition of foreign gases to the system caused a decrease in the product yield which was shown to be due to quenching of the reaction. This is attributed to the collisional deactivation of an excited state intermediate of which the decomposition lifetime has been estimated to lie within the values of 2.6 to 6.4 x 10 to the minus 10th power sec. (Authors' abstract)##

09082

Paul Suppan

SOLVENT AND TEMPERATURE EFFECTS IN THE PHOTOREDUCTION OF KETONES. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967, Part II, Preprints. Max-Plank-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 643-658, Sept. 1967. 15 refs.
CFSTI: PB 176466

The dependence of the quantum yield of photoreduction on solvent polarity and on temperature has been investigated for a number of substituted aromatic ketones. An interpretation in terms of the dipole moments in excited states to account for the solvent effect is discussed. From the temperature effect it is suggested that the different reactivities of n-pi*, pi-pi*, and CT states is related to an activation energy. (Author's abstract)##

09087L

CONCLUSIONS OF THE SYMPOSIUM ON THE PHYSICO-CHEMICAL TRANSFORMATION SULPHUR COMPOUNDS IN THE ATMOSPHERE AND THE FORMATION OF ACID SMOGS, MAINZ/GERMANY, JUNE 8TH/9TH, 1967. Organisation for Economic Co-operation and Development, Paris (France) DAS/CSI/67.99, 7 p., Jan. 17, 1968

The processes of oxidation and transformation of sulphur compounds in the atmosphere are briefly discussed. The catalysed oxidation of SO2 in fog droplets or on aerosol particles is one of the important processes. The controlling factor of SO2 oxidation in fog is the oxidation rate within the droplets which is rather high in the presence of small amounts of catalyst. Removal of SO2 by rainout and washout is also rather efficient. Sources of further information on these subjects, as well as on measurement methods and air quality data, are mentioned.##

09172

Pejack, Edwin R., and Henry R. Velkoff

EFFECTS OF A TRANSVERSE ELECTRIC FIELD ON THE CHARACTERISTICS AND HEAT TRANSFER OF A DIFFUSION FLAME. Ohio State Univ., Research Foundation, Columbus, Contract DA-31-124-ARO-D-246, Proj. 1864, TR-8, 134p., Nov. 1967. 52 refs.
CFSTI, DDC: AD 664180

Effects of a transverse electric field on a parallel flow diffusion flame in a flat combustion chamber were investigated. Various mixtures of propane, nitrogen, and air were introduced separately at the base of an experimental combustion chamber and burned in a diffusion flame sheet located between flat walls of the chamber which served as anode and cathode. The electrode walls were instrumented to measure the local heat transfer rate, local current density, and pressure. It was found that the application of a voltage difference across the electrodes moved ions out of the burning zone and resulted in a current at the electrode walls. The heat transfer rate near the base of the flame was considerably increased on the cathode and decreased on the anode; at positions further from the base of the flame the electric effect was lessened. Flame distortion was thought to be caused by electrically induced gas motion derived from a gradient in current density in the flow direction and by the onset of an electrically induced flame flickering. An analysis of the products of combustion revealed that the applied electric field acted to increase the amount of unburnt solid carbon and decrease the quantities of unburnt fuel and carbon monoxide. (Authors' abstract) ##

09186

P. V. Danckwerts, K. M. McNeil

THE ABSORPTION OF CARBON DIOXIDE INTO AQUEOUS AMINE SOLUTIONS AND THE EFFECTS OF CATALYSIS. Trans. Inst. Chem. Engrs. (London). 45(1):32-49, Jan.-Feb. 1967. 46 refs.

When carbon dioxide is absorbed by aqueous amine solutions, a fast reaction leads to the formation of amine carbamate. This is followed by a slow reaction in the bulk of the liquid, leading to partial hydrolysis of carbamate to bicarbonate. When the second reaction is complete the pressure of carbon dioxide is lower and the concentration of free amine higher. The addition of a catalyst, such as sodium arsenite, speeds up the second reaction and may thereby increase the rate of absorption and the capacity of the absorbent. Calculations are compared with the results of absorption measurements in a stirred cell. The agreement is good and indicates that the mechanism assumed for the absorption process is correct. A catalyst can substantially increase the rate of absorption and the capacity of the solution when the ratio (moles carbon dioxide absorbed/moles amine initially present) is greater than 1/2.

This might form the basis of an economic industrial process for carbon dioxide absorption. (Authors' summary)##

C9200

Tipson, R. S., A. Cohen, and A. J. Fatiadi

AIR POLLUTION STUDIES. In: Robert Schaffer (ed.), Organic Chemistry. July 1966 through June 1967, National Bureau of Standards, Washington, D. C., NBS-TN-427, 11p., Oct. 1967.

Studies have been conducted on polycyclic aromatic hydrocarbons and certain of their oxidation products. A description is given here of the detection of impurities in commercial preparations of polycyclic aromatic hydrocarbons. The procedures used to purify these preparations are discussed. The presence of an impurity in zone refined anthracene was demonstrated. Upon isolation with the use of thin-layer chromatography, carbazole was found to be an impurity. Upon re-examination by thin-layer chromatography two other impurities were discovered. A dimer of anthracene, 9,9:10,10-bianthracene, was prepared. Its ultraviolet and infrared spectra were recorded. In order to establish specifications of purity for anthracene as a possible standard a comparison was made between three commercial samples of anthracene: high purity, synthetic and zone-refined. It was shown that the synthetic anthracene is the purest of the three samples. Fluorene was similarly studied.##

09267

Doepker, R. D., S. G. Lias, and P. Ausloos

PHOTOLYSIS OF CYCLOPENTANE AT 1470, 1236, AND 1048-1067 A. J. Chem. Phys., 46(11):4340-4346, June 1, 1967. 23 refs.

The photolysis of cyclopentane has been investigated at wavelengths of 1470, 1236, and 1048-1067 angstroms. The primary process, which is the elimination of a hydrogen mole from cyclopentane, is of major importance at 1470 angstroms but its quantum yield diminishes at shorter wavelengths where processes involving C-C cleavage becomes more predominant. The products formed in the gas-phase photolysis of cyclo-C5-D10-H2S mixtures and in the solid-phase photolysis of cyclo-C5H10 indicate that the excited cyclopentane molecule undergoes ring opening to form a 1-pentane molecule. In the gas phase, the internally excited 1-pentane decomposes to form methyl and ethyl radicals. At 1048-1067 angstroms, ionization is extensive. On the basis of an isotopic analysis of the propane formed in the photoionization of C5D10-C5H10-O2 mixtures the pattern of the dissociation of the parent ion is determined. Fragmentation of the parent ion diminishes with an increase in pressure. The collisional deactivation process is more pronounced for the

perdeuterated than for the perprotonated cyclopentane ion. The data also indicate that a fraction of the parent ions undergoes ring opening to form cis or trans-2pentene as a final product. (Authors' Abstract) ##

C9398

Georgii, H. W. and E. Kleinjung

RELATIONS BETWEEN THE CHEMICAL COMPOSITION OF ATMOSPHERIC AEROSOL PARTICLES AND THE CONCENTRATION OF NATURAL ICE NUCLEI. J. Rech. Atmospheriques, 3(4):145-156, Oct.-Dec. 1967, 20 refs.

Simultaneous measurements of ice nuclei, Aitken nuclei, and large particles were made during 1964 at the Taunus observatory on Mt. Kleiner Fledberg and also in a suburb of Frankfurt. Chemical analyses were made for several components of the atmospheric aerosols: SO4, NO3, Cl, Na, K, Ca, and NH4 ions. Aitken nuclei do not participate in the freezing process in supercooled clouds at temperatures above -21 deg. C. and the majority of ice nuclei activated at temperatures above -20 deg. C. are in the size-range 0.2-2.0 micron radius. Thus, only large and giant nuclei are important for ice nucleation above -21 deg. C. The authors conclude that the city of Frankfurt constitutes a very productive source of large particles and Aitken nuclei, but the nuclei produced in the polluted atmosphere of the Main valley are activated only at low temperatures which are of little interest to cloud physics. Furthermore, if Aitken nuclei are assumed to coagulate upon the large particles to cover their surfaces, then a residence time of 10 hrs. in a polluted atmosphere would be sufficient to contaminate the surfaces of these large particles, and thus lead to a deactivation of potential ice nuclei.

09437

Sazonov, L. A. and E. V. Artamonov

INVESTIGATION OF THE MECHANISM OF THE OXIDATION OF CARBON MONOXIDE ON LANTHANUM OXIDE. Kinetika i Kataliz, 8(3):546-550, May-June 1967. 6 refs.

The mechanism of the oxidation of CO on lanthanum oxide in the temperature region 300-420 degrees was investigated using radioactive carbon C14. Below 300 degrees, the reaction proceeds with an activation energy E1 equals 3 kcal/mole and is accompanied by complete adsorption of the CO2 formed on the Surface of the oxide. In the region of 300-400 degrees, the limiting step is desorption of CO2 with an activation energy E2 equals 19 kcal/mole; below 400 degrees, the limiting step is the rate of chemisorption with E3 equals E1 equals 3 kcal/mole. It is believed that the oxidation of CO proceeds through a stage of formation of a complex of the type CO3 with an activation energy of the dissociation CO3 yields CO2 plus O= equal to 40 kcal/mole. (Authors' abstract) ##

09441L

Mueller, W. J. and P. B. Stickney

EVALUATING THE RELIABILITY OF AN ACCELERATED TEST FOR QUALIFYING OZONE-PROTECTIVE WAXES. (FINAL PROGRESS REPORT.) Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Contract DA-28-043-AMC-00496-(E), ((43))p., March 30, 1967.
DDC: AD 824072

The reliability of an accelerated test for qualifying ozone-protective waxes is evaluated. Thirty waxes were screened in an accelerated laboratory test using a styrene-butadiene rubber (SBR) composition to determine their ability to protect against ozone cracking. Ten waxes were incorporated into SBR-jacketed cable for outdoor exposure tests, the results of which were correlated with accelerated laboratory tests. The conclusions reached were: The accelerated ozone test developed is not adequate for qualifying ozone-protective waxes. Mandrel-wrapped cable is more susceptible to cracking than dumbbell specimens. In the round-robin program to evaluate the reproducibility of the accelerated test among laboratories, good reproducibility was obtained when the laboratories followed the procedure carefully. Outdoor exposure tests showed a wide variation, even among approved waxes, in their ability to protect against cracking. Correlation between accelerated tests and outdoor exposure was limited. An accelerated test developed for SBR should be usable with neoprene or natural rubber with litter or no modification.##

09576

Hisatsune, I. C.

ESTIMATION OF THE ISOMERIZATION RATE OF NITROUS ACID. J. Phys. Chem., 72(1):269-271, Jan. 1968. 9 refs.

The rate constant for the unimolecular isomerization of cis - nitrous acid to the trans acid has been calculated by using the transitionstate model. The one-dimensional potential-energy function for the barrier to internal rotation of the HO group and the necessary force constants and structural parameters of the transition complex were obtained from an earlier infrared study of isotopic nitrous acids. Quantum correction arising from the penetration of the potential barrier does not appear to be important. The isomerization half-life is about three orders of magnitude shorter than that of the formation of the acids from NO, NO2, and H2O. (Author's abstract, modified)

09749

Darwent, B. deB., R. L. Wadlinger, and Mary John Allard

THE PHOTOCHEMICAL DECOMPOSITION OF HYDROGEN SULFIDE. THE REACTIONS OF HYDROGEN ATOMS AND HS RADICALS. J. Phys. Chem., 71(7):2346-2347, June 1967. 10 refs.

The photolysis of H2S as a means of studying the reactions of H atoms hinges on the assumptions that the H atoms produced by the photolysis do not contain a significant amount of excess energy and that the HS radicals disappear without producing H or H2. The above assumptions have been examined by observing the effect of a large excess of inert gas (CO2) on the rates of formation of H2 in the photolysis of H2S mixed with I2 and Br2 and by photolyzing acetone in the presence of H2S and analyzing the products for H2. The results show that the photolysts of H2S is an acceptable method for producing H atoms for kinetic studies, provided that an inert gas is present in large excess.

09755

Cullis, C. F., R. M. Henson, and D. L. Trimm

THE KINETICS OF THE HOMOGENEOUS GASEOUS OXIDATION OF SULPHUR DIOXIDE. Proc. Roy. Soc. (London). Ser.A, Vol. 295, p. 72-83, Nov. 8, 1966. 20 refs.

Studies of the gaseous oxidation of sulphur dioxide show that in the absence of added catalysts an apparently homogenous reaction can be observed only over a rather narrow temperature range (900 to 1050 deg. C). On the basis of the dependence of the rate of this reaction on the concentration of the reactants and of the value of the activation energy a tentative reaction mechanism is proposed which involves initially the collisional activation of sulphur dioxide. In the presence of nitric oxide, reaction takes place at an appreciable rate at temperatures as low as 400 deg. C. The catalysed reaction is essentially homogeneous and its rate is unaffected by nitrogen and water vapour. At fairly high concentrations of nitric oxide, the rate is approximately proportional to the square of the catalyst concentration and to the first power of the oxygen concentration, but is almost independent of the concentration of sulphur dioxide and of temperature. In the presence of lower concentrations of the additive, the rate is approximately proportional to the first power of both the nitric oxide and oxygen concentrations, increases slightly with the sulphur dioxide concentration, and is appreciably dependent on temperature. The observed kinetic relationships can be satisfactorily explained in terms of a mechanism involving the interaction of sulphur dioxide with the species, NO2 and NO3, the relative contribution of the two reactions vary with the concentrations of the reactants and with temperature.

09764

Altman, Philip L. and Dorothy S. Dittmer (comps. and eds.)

ATMOSPHERE AND POLLUTANTS. (CHAPTER V.) In: Environmental Biology, Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio, Contract AF33(615)-2252, NIH-GM-06553, NASA-NASr-234, Proj. 7164, Task 716406, AMRL-TR-66-194, p. 269-329, Nov. 1966. (300) refs.

Numerical data on air pollutants are compiled and tabulated for a broad range of problems. The effects of pollutants on human health, plants and livestock are presented. Characteristics and chemical composition of the atmosphere and its pollutants are compiled. Data on emission sources of pollutants and their distribution at various periods of time in different locales are presented. Other categories covered are air dispersion of small organisms, biological effects of gaseous ions, and spacecraft and nuclear submarine atmospheres.

10027

Hidalgo, Alberto F. and Clyde Orr, Jr.

HOMOGENEOUS NUCLEATION OF SODIUM CHLORIDE SOLUTIONS. Ind. Eng. Chem Fundamentals, 7(1):79-83, Feb. 1968. 14 refs.

Experimental confirmation of the theory of homogeneous nucleation for electrolyte solutions is demonstrated by an analysis of the behavior at 25 deg.C. of an aerosol composed of supersaturated sodiu chloride solution droplets 0.01 to 0.1 micron in diameter. (The ter homogeneous applies to systems devoid of foreign nuclei.) The humidity of the air with which the aerosol was in equilibrium was adjusted to attain a series of droplet supersaturation states. Nucleation and crystallization of the droplets subsequently ensued, being detected by an ion counter that permitted following the size o the aerosol particulates as a function of time at specific relative humidities. The behavior of the aerosol could be attributed to homogeneous nucleation because only a small proportion of the droplets contained foreign nuclei when they were formed on sub division of the original liquid. The time for nucleation was found to be a logarithmic function of the electrolyte activity as theory predicts. (Authors' abstract)

10037

Chia, Wu-sun, Joan Jacobs, and B. H. Sage

OSCILLATORY COMBUSTION AT ATMOSPHERIC PRESSURE MONOCHROMATIC AND TOTAL OPTICAL INTENSITY. (TECHNICAL REPORT.) California Inst. of Tech., Pasadena, Chemical Engineering Lab., Ms-4236, 35 p., 1968. 8 refs.

A number of measurements were made upon the perturbations in monochromatic and optical intensity, in the course of oscillatory combustion of air and natural gas at atmospheric pressure. These measurements were obtained as a function of mixture ratio and, to a more limited extent, of the effect of changing the effective length of the combustor. As would be expected, the maximum perturbations i monochromatic intensity corresponded closely to the maximum perturbations in normal stress. Variations in the length of the combustor influenced materially the magnitude of the perturbations i normal stress. These changes in length also caused a similar fluctuation in the monochromatic intensities which corresponded to

the wave lengths of water and carbon dioxide. At combustor lengths corresponding to nonoscillatory combustion, the perturbations in optical intensity are approximately equal to the standard deviation of the measurements. This is characteristic of the poison distribution such as often is experienced in nonoscillatory turbulen combustion. (Authors' introduction)

10041

Goetz, Alexander and Olgierd J. Klejnot

TRANSFORMATION OF GASEOUS REACTIVE HYDROCARBONS INTO AEROCOLLOIDS ULTRAVIOLET IRRADIATION. J. Air Pollution Control Assoc., 17 (9):600-603, Sept. 1967.

A substantial variety of hydrocarbons, particularly the reactive types, can be converted from the gaseous into the aerocolloidal stat by brief exposure to UV-irradiation. The procedure for evaluating the capacity of various hydrocarbons to form aerocolloids, and thus to define the difference between non-reactive and reactive types, is illustrated. Two sensoring devices were utilized; an aerosol photometer and a moving slide impactor. A summary includes these observations: the aerocolloid formation by ultraviolet exposure is due to intermediate oxidation states of the molecules with a high tendency to polymerize into sub micron particulates. High humidity levels increase the reaction rate and thus the aerosol formation. The characteristic difference between saturated and unsaturated HC types is the much lesser VU-reactivity of the former. This method permits the tracing of organic components in the open atmosphere. I promises to facilitate the simple and rapid discrimination between the neutral and potentially reactive HC types.

10043

Levy, Authur and Earl L. Merryman

SULFUR-OXIDE FORMATION IN CARBONYL SULFIDE FLAMES. Preprint, Battelle Memorial Inst., Columbus, Ohio. Columbus Labs., (26)p., (1968). 10 refs.

Oxidation processes in low pressure (1/10 atm) carbonyl sulfide flames are examined. Two distinct reaction zones are noted, first, zone in which carbon monoxide and sulfur dioxide are formed, and second, a zone in which the carbon monoxide oxidation is completed. Kinetic analysis suggests that the initial step is the abstraction o a sulfur atom by an oxygen molecule. The rate constant for this reaction is calculated.

10045

Nemeth, Andras and Robert F. Sawyer

THE OVERALL KINETICS OF HIGH TEMPERATURE METHANE OXIDATION IN A

FLOW REACTOR. California Univ., Berkeley, Division of Thermal Systems, 68-2, 20p., (1968). 20 refs.

The rate of methane consumption in an oxidation reaction was measured in a non-isothermal flow reactor in the temperature range o 1180-1282 deg. K. The reaction was monitored by mass spectrometric analysis. The following overall rate expression was found valid, however, only for temperatures greater than 1200 deg. K. The result is in reasonable agreement with data measured by another method in the high temperature range. (Authors' abstract modified)

10066

Shaw, J. T. and P. D. Green

OXIDATION OF SULPHUR DIOXIDE IN AIR AT 950 DEG C: CO-OPERATIVE INFLUENCES OF CARBON MONOXIDE AND NITRIC OXIDE. Nature, 211(5054):1171-1172, Sept. 10, 1966. 8 refs.

The oxidation of sulfur compounds in fuel during composition to form sulfur dioxide and the further oxidation of this to sulfur trioxide gives rise to the problem of corrosion, specifically in boilers. The part played by oxides of nitrogen and carbon, both of which occur influe gases from normal fuels, and their influence on the oxidation of sulfur dioxide in a clean system has been investigated. A marked effect on sulfur trioxide production was found when nitric oxide and carbon monoxide were present together. The experiment is described.##

10078

Chermack, E. A. (ed.)

SUMMARY OF THE CONFERENCE ON THE OPTICAL PROPERTIES OF AEROSOLS, 15-17 OCTOBER 1964. New York Univ., Bronx, Research Div., Contract DA 36-039-AMC-03411-(E), 63p., July 1965. CFSTI, DDC: AD 646612

The summary of a conference is presented where the optical, physical, and chemical properties of atmospheric aerosols are discussed, and the influence of these aerosols on radiation are considered. The properties and behavior of aerosols is dependent on particle size, and chemical composition depends on humidity and location. Measurement methods for optical scattering and other properties are discussed.

10119

Laseter, J. L., D. L. Weber, H. Schneider, and J. Oro

STUDIES ON THE INCORPORATION OF ACETATE-1-14C AND STEARATE-UL-14C INTO THE HYDROCARBONS OF CHLORELLA PYRENOIDOSA. Houston Univ.,

headings: general principles of absorption spectroscopy of optically homogeneous specimens, and the spectral function of transmission; the spatial and structural functions of transmission for heterogeneous medium without scattering, and methods of emersion and compression; light propagation in a scattering medium, and the transfer matrix and its relation to the parameters of the medium; a general statement of the problem of spectral analysis of macroscopically homogeneous light-scattering bodies; and concrete methods for spectroscopy of light-scattering substances. In the last category, these methods are discussed: a narrow directional beam; methods based on low-frequency scattering; spectroanalytic use of measurements of the light field within a scattering medium; spectroscopy of thick layers of scattering materials with small specific absorption; luminescence analysis; and other methods.##

10422

A. K. Chatterjee, and B. K. Mazumdar

METHYL GROUPS IN COAL. Fuel, 47(2):93-102, March 1968. 13 refs.

The contention that methane formed during low temperature pyrolysis (600 degrees C) owes its origin almost exclusively to the methyl groups in coal and that such methane formation (including small proportions of ethane) represents the maximum or true measure of the methyl content is re-examined in the light of the pyrolysis behaviour of nitro-coals. Nitration is believed by the authors to cause selective oxidation of the methyl groups to carboxyl groups (apart from the introduction of a considerable proportion of nitro-groups in coal). It has now been found that such nitro-coals on pyrolysis at 600 degrees C yield no methane and little of other hydrocarbons, but much carbon dioxide, the volume of which after due corrections appears to be of a magnitude similar to that of the methane obtainable by pyrolysis at 600 degrees C of the corresponding untreated coals. Further, nitro-coals by reductive decarboxylation followed by thermal decarboxylation at 350 degrees C for completeness yield a volume of carbon dioxide virtually equal to that of the methane obtainable by pyrolysis of the untreated coals. These findings appear to confirm the authors' previous hypothesis of the origin of methane during pyrolysis at 600 degrees C, and hence the validity of assessment from this of the methyl content in coals.##

10507

Schuetz, Alfred

THE ELECTRICAL CHARGING OF AEROSOLS. Staub (English translation 27(12):24-32, Dec. 1967. 24 refs.
CFSTI: TT 67-51408/12

The most important charging mechanisms for aerosols and the magnitude of the electrical charge of an individual particle are

discussed. Charging by diffusion is solely governed by the thermal motion of ions in the gas envelope surrounding the particle. Charging by ion bombardment in the electrical field is effected in a unipolar ionization zone, e.g., in a corona discharge. A further possibility of particle charging consists in the direct contact of the particles with electrodes carrying a potential. The charging of particles can be accomplished by contact-electrical processes, whereby the magnitude decisive for electrical charging is the contac potential between the two contacting materials. In the stirring-up of deposited dust electrical charging is solely effected by the separation of the contact points between the particles, as well as between the particles and their support. Atomization of liquids is discussed as another method for charging dispersed particles (positive or negative).

10512

Simonaitis, R. and J. N. Pitts, Jr.

PHOTOCHEMISTRY OF GAMA-BUTYRCLACTONE IN THE LIQUID PHASE. Preprint California Univ., Riverside, Dept. of Chemistry, 18p., (1965/)

The photolysis of gama-butyrolactone was investigated in the liquid phase with the 2537A line of a mercury resonance lamp. The majcr products were allylformate, succinaldehyde, cyclopropane, and carbon dioxide with quantum yields at 25 deg. C of the 0.23, 0.06, 0.013 and 0.015, respectively. From product quenching data, it is suggested that triplet-triplet energy transfer from gama butyrolactone to cis-butene, transbutene, cyclohexene and biacetyl occurs at a diffusion controlled rate and that the allylformate and cyclopropane originate from one state, probably a triplet, but that succinaldehyde originates from a different state. Added isopropyl alcohol quenched the formation of allylformate and cyclcpropane, but acetonitrile as a solvent had no effect on their yields over the concentration range of 0.3-16.0 moles/liter. An increase in temperature from 25 deg. C to 98 deg. C increased the yields of succinaldehyde and cyclopropane and decreased the yield of allylformate, but the sum of the quantum yields of these products remained relatively constant. (Authors' abstract)

10519

Covell, Gavin W. and James N. Pitts, Jr.

PHOTOCHEMICAL STUDIES IN RIGID MATRICES. II. A STUDY OF THE PHOTOCHEMICAL REACTIVITY OF ANTHRACENE IN POLYSTYRENE AND THE DEVELOPMENT OF AN O-NITROBENZALDEHYDE ACTINOMETER IN POLYMETHYLMETHACRYLATE. Preprint, California Univ., Riverside, Dept. of Chemistry, (19)p., (1967/).

The photochemistry of o-nitrobenzaldehyde and anthracene in rigid polymer films has been studied at 25 deg. and 3340 and 3660A. o Nitrobenzaldehyde 'dispersed' in polymethylmethacrylate, M.W. < 20,000 plus or minus 3,000, undergoes the well known photo isomerization to o-nitrosobenzoic, the quantum yield being 0.05 plus

or minus 0.06. Within experimental error, this is the same as in fluid solutions and in the pure sold. In view of the stability and convenience of this system, its use as an actinometer in the spectra region 2800-4100A is envisaged. Anthracene 'dispersed' in polystyrene, M.W. < 47,000 plus or minus 4,000, undergoes photodimerization at a rate much reduced from that in fluid solution or in a potassium bromide pellet. The nature of the 'dispersion' of the nathracene in the film differs significantly from its state in potassium bromide matrices. In the presence of oxygen, the major part of the photochemical reaction leads to the formation of the photooxide of anthracene. Kinetic and mechanistic details are discussed. (Authors' abstract)

10522

Pratt, David Terry

COMBUSTION OF AMMONIA AND AIR IN A WELL-STIRRED REACTOR. Thesis (Ph.D), California Univ., Berkeley, Coll. of Engineering, May 1968, 106p. 52 refs.

An adiabatic, well-stirred reactor was used to determine the over-all chemical reaction rate constants for the near-homogeneous, gas-phase combustion of ammonia and air. The overall reaction rate for ammonia-air combustion in a back-mixed combustion system can be well represented by an Arrhenius equation. The experimentally obtained activation energy, pre-exponential factor, fuel and oxygen reaction orders do not agree well with those reported from earlier investigations. Such values appear to depend on the pressure, temperature, reactant concentrations and diluent employed in the various studies. With aging of the zirconium dioxide reactor walls, the slow oxidation reaction regime became more evident and persistent, and slow oxidation data were not reproducible after a few hours of operation. On the other hand, fast oxidation conditions were reproducible. This seems to imply clearly that the wall plays an important role in the slow oxidation reaction mechanism. The maximum attainable loading, for an inlet temperature of 400 degrees K, was 20 times less than maximum loadings obtained with hydrocarbon fuels at the same inlet temperature. Blowout limits can be corrected effectively for inlet temperatures varying from 300 degrees K to 500 degrees K.##

10907T

Lunge, G. and E. Berl

NITROGEN OXIDES AND THE LEAD CHAMBER PROCESS. II. BEHAVIOR OF A MIXTURE OF GASES, PRESUMABLY NO + NO2, IN CONCENTRATED SULFURIC ACID AND SODIUM HYDROXIDE 1/5 N. ((Untersuchungen ueber Stickstoffoxyde und ueber den Bleikammerprozess. II. Verhalten eines Gasgemisches von der ungefaehren Zusammensetzung NO + NO2 gegen konz. Schwefelsaeure und 1/5-n. Natronlauge.)) Translated from German. Z. Angew. Chem. (Weinheim), 19(19):857-869, May 1906.

The behavior of a gas mixture containing NO and NO2 in sulfuric acid and sodium hydroxide was investigated with the result that for analytical purposes sulfuric acid is the only absorption liquid for this gas mixture. Also the behavior of nitrogen oxide in the presence of oxygen and water was studied together with the kinetics of nitrogen oxide oxidation with oxygen or air. The kinetic curves indicated that the reaction 2NO+O2=N2O4 takes place at a constant rate which indicates that the oxidation takes place directly without formation of N2O3 as an intermediate.##

10910T

Hautefeuille, P. and J. Chappuis

PARANITRIC ACID. ((Sur l'acide pernitrique.)) Translated from French. Comp. Rend. (Paris), 94:1111-1114, 1882.

Nitrogen peroxide formed when ozone is prepared by electric discharge in dry air was further investigated. The rate at which the peroxide is formed was studied by spectroscope. Also its conversion into another oxide was studied by pressure measurements. The present article published in 1882 has historical significance and deals with the formation of nitrogen oxides by electrical discharge.##

10911T

Bodenstein, M.

THE RATE OF THE REACTION BETWEEN NITRIC OXIDE AND OXYGEN. (Die Geschwindigkeit der Reaktion zwischen Stickoxyd und Sauerstoff.) Translated from German. Elektrochem. angew. physik. Chemie (Weinheim), 24(13/14):183-201, July 1, 1918. 30 refs.

The oxidation of nitric oxide with oxygen was studied kinetically by pressure recordings at temperatures from 0 to 90 degree C. The reaction took place acording to the third order process 2NO + O2 = 2NO2. The rate was independent of NO2, H2O and SO2 admixtures. The experiments proved that Raschig was incorrect when he assumed that NO is first rapidly oxidized to N2O3 which is then slowly converted to NO2.##

10912T

Bodenstein, Max

THE SPEED OF THE COMBINATION OF NITRIC OXIDE AND OXYGEN. ((Die Geschwindigkeit der Vereinigung von Stickoxyd und Sauerstoff.) stoff.)) Z. angew. Chem. (Weinheim), 31:145-148, July 30, 1918.

The reaction rate of nitric oxide with oxygen was determined by batch experiments. The conversion rate was determined from the measured pressure change. Experiments were also made to

elucidate possible side reactions and catalytic effects. The result of the study indicates that the reaction takes place according to the trimolecular equation 2 NO + O2 = 2 NO2 and not as suggested by Raschig by a two stage reaction with N2O3 as an intermediate.##

10913T

Bodenstein, Max

FORMATION AND DECOMPOSITION OF THE HIGHER OXIDES OF NITROGEN. ((Bildung und Zersetzung der hoheren Stickoxyde.)) Translated from German. Z. Physik. Chem. (Leipzig), 99:68-123, 1922. 19 refs.

The formation and decomposition of higher nitrogen oxides was studied by determining the equilibrium constants of the reactions 2NO2 yields N2O4 in the temperature range of 9-115 degree C and 2NO2 yields 2NO + O2 in the range of 220-550 degree C. Expressions for the logarithm of the equilibrium constants as a function of temperature were obtained. Also the rate constants of the reaction 2NO + O2 = 2NO2 was determined in the temperature range of 140-390 degree C. Reaction mechanisms are discussed.##

10917T

Gewitz, H. S. and W. Volker

INHIBITION OF PHOTOSYNTHESIS BY CARBON MONOXIDE AND SUSPENSION OF THE CARBON MONOXIDE INHIBITION BY LIGHT. (Hemmung der Photosynthese durch Kohlenozyd und Aughebung der Kohlenoxydhemmung durch Licht.) (Translated from German). Naturforsch. (Tuebingen), 18b(8):649-653, Aug. 1963. 5 refs.

Experiments with chlorella pyrenoidosa in an atmosphere of CO2-argon and CO2-CO were made to study the inhibition of photosynthesis by carbon monoxide. It was found that cells grown in light show inhibition of photosynthesis by carbon monoxide. Inhibition is reversible and depends on the CO and O2 partial pressures. Also the effect of the spectral characteristics of light on the inhibition of photosynthesis was studied. The experiments indicated that in photosythesis an enzyme is involved which has an effective group containing iron. This enzyme transports oxygen in photosynthesis. Carbon monoxide inhibits photosynthesis by binding the iron in the enzyme. The absorption spectrum of the carbon of the photosynthesis was determined. The carbon monoxide compound can be split by light and thus inhibition is stopped.##

11050

E. R. Stephens

CHEMISTRY OF ATMOSPHERIC OXIDANTS. Preprint, California

Univ., Riverside, Statewide Air Pollution Research Center, 12p., 1968. 15 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minnesota, June 23-27, 1968, Paper 68-57.)

All of the important oxidants in polluted air are formed there by chemical reactions which occur among the primary pollutants. The most abundant of these oxidants is ozone which is formed in a cycle involving nitric oxide, nitrogen dioxide, atmospheric oxygen, and hydrocarbons. This ozone is best understood, not as a reaction product, but as an intermediate in steady state concentration between formation and disappearance reactions. Hydrocarbons permit accumulation of ozone by reacting to scavenge the nitric oxide which would otherwise remove the ozone. The amount of ozone which can be formed in ambient polluted air is limited to about one ppm because these scavenging reactions become less effective when the nitric oxide concentration becomes very small. The peroxyacl nitrates are a group of oxidants which result from reactions between oxides of nitrogen and organic pollutants. Olefinic and aromatic hydrocarbons make the largest contribution to PAN formation; saturates contribute little if any. the role of nitrogen dioxide and other oxidizing agents is also discussed. (Author's abstract) ##

11147

Fatiada, A. J.

PERIODIC ACID, A NOVEL OXIDANT OF POLYCYCLIC, AROMATIC HYDROCARBONS. J. Res. Nat. Bur. Std. A, 72A(4):341-350, July-Aug. 1968.

Certain polycyclic, aromatic hydrocarbons can be oxidized with periodic acid in aprotic solvents containing a small proportion of water. A unique, two-fold character of response to periodic acid by these hydrocarbons has been found: (1) production of a coupling reaction through a radical intermediate ((conversion of pyrene into 1,1'-bipyrene, and fluorene into 1,2-bis (2,2'-biphenylylene ethylene)) or (2) conversion into quinones by a two-equivalent oxidation mechanism that does not involve a radical intermediate ((acenaphthenem andtracen, anthrone, benz((a)) anthracene, naphthalene, and phenanthrene)). Little or no reaction was observed when oxidation was attempted with sodium metaperiodate instead of periodic acid. Electron-spin resonance revealed no radical intermediate in the oxidation of malonic acid with either periodic acid or sodium periodate. (Author's abstract)

11188

Windsor, M. W., and J. R. Novak

STUDIES OF RADIATIONLESS TRANSITIONS IN CORONENE USING NANOSECOND LASER PHOTOLYSIS AND SPECTROSCOPY. Preprint, TRW Systems, Redondo Beach, Calif. Chemical Sciences Dept., (18)p., 1968. 20 refs. (Presented at the International Conference on Molecular Luminescene Loyola Univ., Chicago, Ill., Aug. 20-23, 1968.)
CFSTI: AD 672997

We have used the technique of nanosecond laser photolysis and spectros q spectroscopy to observe absorption from both the lowest excited singlet state S1, and the lowest triplet state T1, of coronene. The technique employs a Q-switched ruby laser to produce both a 30 nsec pulse at 347 nm for excitation, plus, at the same time, a laser-induced spark which provides a background continuum for absorption spectroscopy. Time-resolved spectra are obtained with an image converter camera. We have observed new transient absorption bands for coronene at 520 and 380 nm and attribute these to absorption by the S1 state. The new bands locate previously unobserved higher singlet level of g parity. These bands decay over a period of several hundred nanoseconds and are concomitantly replaced by absorption bands characteristic of the lowest triplet state, thus providing a pictoral record of the process of intersystem crossing. We have also obtained the T-T absorption spectrum of coronene in epoxy plastic out to 1.14 microns using a double-beam cross-irradiation technique. New maxima in the infrared serve to locate th energies of three low-lying excited triple levels. From the energy level data we believe that in coronene intersystem crossing from higher singlet states to the triplet manifold may occur. We discuss how our kinetic observations of the decay of the lowest excited singlet and the build-up of the lowest triplet state bear on a recently proposed stationary state model of radiationless transitions. (Authors' abstract)

11205

Liu, Benjamin Y. H.

RECENT AEROSOL RESEARCH - UNIVERSITY OF MINNESOTA PARTICLE TECHNOLOGY LABORATORY. Preprint, Minnesota Univ., Minneapolis, Particle Technology Lab., ((12))p., 1968. ((23)) refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-28, 1968, Paper 126.)

A summary of research studies on methods for the generation, measurement and sampling of aerosols is presented. Theoretical and experimental research of the electrical charging of aerosol particles by gas ions, the size distribution of atmospheric aerosols, aerosol formation in high-temperature plasmas and from molten metal, and the basic properties of chain aggregate smoke particles are discussed.##

11210

Miller, William J.

FLAME IONIZATION AND COMBUSTION INHIBITION. (TECHNICAL REPORT NO. 1.) Aerochem Research Labs.$ Inc., Princeton, N.J. CST-102, TP-151, 23p., Jan. 1967. 17 refs.

The inhibition of spherically symmetrical low-pressure CH4 or C2H2/O2 diffusion flames by a variety of additives has been studied. The relative efficiencies of the compounds studied have

been found to be very nearly the same as in 1-atm flames. A detailed examination of the effects of CCl4, Fe(CO)5, and CrO2Cl2 upon ion content and emission spectra has been made and the results interpreted in terms of previously postulated correlations between the ability of a given compound to reduce electron concentrations and its effectiveness as a flame inhibitor. No such correlation was found to exist and it has been concluded that for these flames no causal relationship exists between the two phenomena. The relatively large inhibition efficiencies of Fe(CO)5 and CrO2Cl2 are attributed to in situ ultrafine particle formation downstream of the flame front and their subsequent diffusion into the reaction zone. The formation of these particles is indicated by ion profiles of nucleating species; the presence of the particles in the reaction zones of inhibited flames is further evidenced by the emission of continuum radiation. The dominance of diffusional over convective mass transport is the characteristic of the system which accounts for its susceptibility inhibition by these compounds. (Author's summary)##

11239

S. Susan, D. H. Slater, and J. G. Calvert

THE PHOTOCHEMISTRY OF THE AZOALKANES. Preprint, Ohio State Univ., Columbus, Evans Chemical Lab., ((29))p., ((1968)). ((34)) refs.

The photochemistry of the azoalkanes has been the subject of many studies in several laboratories. The major interest developed because of their attractiveness as free radical sources. The first absorption band lies in the accessible near ultraviolet, and in the gas phases a large fraction of the light-absorbing molecules decompose to form free radicals. In the gas phase photolysis of azoalkanes of higher complexity, a significant fraction of the light-excited molecules do not decompose, but are stabilized by a second order kinetic process which is often termed "collisional deactivation". A description of the photochemistry of 1, 1'-azoisobutane is given. A kinetic study of the products of the gas phase photolysis of 1,1'azoisobutane is presented.##

11243

Robert D. McCuigg, and Jack G. Calvert

THE PHOTODECOMPOSITION OF CH2O, CD2O, CHDO, AND CH2O-CD2O MIXTURES AT XENON FLASH LAMP INTENSITIES. Preprint, Ohio State Univ., Columbus, Ohio, Evans Chemical Lab., ((33))p., 1965. (Presented at the 149th Meeting, American Chemical Society, Symposium on Structure and Photochemistry of Excited States, Detroit, Mich., April 1965.)

The volume and composition of the gaseous products of the photolyses of the pure formaldehydes, CH2O, CD2O, and CHDO, and mixtures CH2O and CD2O, were determined in experiments at various xenon flash lamp intensities, pressures of aldehyde,

temperatures, and at selected wavelength regions of the aldehyde absorption. The only products of the formaldehyde photolysis detected in these experiments were carbon monoxide and hydrogen. The average value of the ratio of the total hydrogen (H2, HD, and D2) to carbon monoxide for 58 runs was 0.98 + 0.08 (std. dev.). There was no detectable trend in the ratio caused by variations in intensity wavelength, temperature, or reactant isotopic composition over the range studied in this work. In several preliminary experiments at 80 degrees using Filters 1 and 2, various pressure of pure CH2O or CD2O were given a single 10 Kv flash. The volume of the hydrogen product was found to be a linear function of the pressure of the aldehyde used. Less CD2O decomposes than does CH2O under the same conditions of pressure temperature, and incident light intensity. This probably results from a combination of the usual isotopic effect observed when C-D bonds are broken and the smaller absorption by CD2O over the spectral regions involved in this study. In further preliminary experiments at 80 degrees using Filters 1 and 2, the flash voltage was varied in experiments at fixed aldehyde pressure and the volume of hydrogen measured. The volume of the hydrogen product from the aldehyde photodecomposition is proportional to the square of the charging voltage (or the flash energy). The data from the flash experiments of CH2O-CD2O mixtures at various temperatures and filter combinations are summarized. Similar data from the flash experiments using CHDO are given.##

11245

T. Navaneeth Rao, Susan S. Collier, and Jack G. Calvert

THE QUENCHING REACTIONS OF THE FIRST EXCITED SINGLET AND TRIPLET STATES OF SULFUR DIOXIDE WITH OXYGEN AND CARBON DIOXIDE. Preprint, Ohio State Univ., Columbus, Evans Chemical Lab., ((25)) p., 1968. 12 refs. (Presented at the 156th National American Chemical Society Meeting, Atlantic City, N. J., Sept. 1968.)

A determination has been made of the quantum yields of fluorescence and phosphorescene of sulfur dioxide excited at 2875 A and 25 degrees in mixtures with added oxygen or carbon dioxide. Estimates of the rate constants (units l-mole-sec) for the quenching reactions of both the first excited singlet and triplet sulfur dioxide molecules with SO2, O2, and CO2 were derived from the published lifetime data for excited sulfur dioxide, and from other data. (Authors' abstract, modified)##

11248

David H. Slater, and Jack G. Calvert

THE PHOTOOXIDATION OF 1,1'-AZOISOBUTANE: THE REACTIONS OF THE ISOBUTYL FREE RADICAL WITH OXYGEN. Preprint, ((19)) p., 1967. (Presented at the International Oxidation Symposium, San Francisco, Calif., Aug. 29, 1967.)

A study has been made of the photooxidation of 1,1'azoisobutane in experiments at 3660 A and full mercury arc and at temperatures from 308 to 405 degrees K. The data prove the unimportance of energy transfer and singlet oxygen involvement for this system. The rates of products and their quantum yields are consistent with a mechanism involving the reactions of the isobutyl free radical with oxygen. The product distribution suggests that the isobutylperoxyl and/or isobutoxyl free radicals are unstable toward a decomposition reaction even at 308 degrees K for our conditions (Authors' abstract)##

11249

T. Naveneeth Rao, Susan S. Collier, and Jack G. Calvert

PRIMARY PHOTOPHYSICAL PROCESSES IN THE PHOTOCHEMISTRY OF SULFUR DIOXIDE AT 2875 A. Preprint, Ohio State Univ., Columbus, Evans Chemical Lab., ((25))p., 1968. 16 refs. (Presented at the 156th National American Chemical Society Meeting, Atlantic City, N. J., Sept. 1968.)

The quantum yields of fluorescence and phosphorescence of sulfur dioxide excited by 2875 A radiation and the quantum yields of SO2-sensitized biacetyl phosphorescence have been measured in pure sulfur dioxide and in its mixtures with small amounts of biacetyl. From the variation of functions of these quantum yields with varied experimental parameters and the previously published lifetime data for singlet and triplet sulfur dioxide molecules, values of the rate constants (in 1-mole-sec units) for all of the individual primary photophysical processes in sulfur dioxide photolysis have been determined. (Authors' abstract modified)##

11279

Jaffe, Sigmund and Fritz S. Klein

ISOTOPIC EXCHANGE REACTIONS OF ATOMIC OXYGEN PRODUCED BY THE PHOTOLYSIS OF NO2 AT 3660 A. Trans. Faraday Soc. 62(527), Part II, pp. 3135-3141, Nov. 1966. 26 refs.

Isotopically labelled atomic oxygen, produced by the photolysis of N13O2 at 3660 angstroms, was allowed to react with CO, CO2 N2O, O2 and COCl2, respectively. The rates and mechanisms of the exchange reactions are discussed. The specific rate constants were determined for the process.##

11533

Foote, Christopher S., and Shi-Yin Wong

ON THE QUESTION OF TWO REACTIVE OXYGEN SINGLETS. Preprint, California Univ., Los Angeles, Dept. of Chemistry, 10p., ((1968)). 13 refs.

Research work into the mechanism of photooxidation reactions involving excited singlet and triplet molecular oxygen is presented. The mechanism of the reactions is approached by the study of dye-bleaching reaction kinetics.##

11742

Simecek, A., A. Regner, and J. Vosolsobe

KINETICS AND MECHANISM OF SULPHUR DIOXIDE OXIDATION ON A VANADIUM CATALYST. I. INFLUENCES OF THE OXYGEN PARTIAL PRESSURE ON THE RATE OF OXIDATION. Collection Czech. Chem. Commun. (Prague), 33(7):2162-2168, 1968. 44 refs.

The rate of oxidation of SO2 on a vanadium catalyst (6% V2O5 by weight and a molar K2O:V2O5 ratio 4.0, supported on kieselguhr, with a specific surface area of 2 m2/g, a pore volume of 0.28 cc/g, and mean pore radius of 2880A) at 460-520 deg C was measured in a differential reactor with gas recirculation; the proportions of SO2 and O2 in the inlet gas were varied from 7-15% and from 5-24.5%, respectively. The reaction rate, which decreased rapidly with time under all conditions, increased uniformly with both increasing temperature and increasing O2 concentration. The reaction was found to be first order with respect to oxygen, indicating that the rate-determining step is probably the reaction of O2 with the catalyst. The apparent activation energy was calculated to be 29.0-36.6 kcal/mole, decreasing with increasing degree of conversion.##

11770

Ballod, A. P., S. I. Molchanovo, and V. Ya. Shtern

MECHANISM OF THE VAPOUR-PHASE INTERACTION OF ALKANES WITH NITROGEN DIOXIDE. (THE KINETICS AND CHEMICAL PECULIARITIES OF THE SLOW REACTION C3H8-NO2). Neftekhimiya (Russia), 7(1):115-123, 1967. 20 refs. Translated from Russian. Ministry of Technology, Orpington Kent, England, TIL Reports Centre, TIL/T 5757, Aug. 1968.
CFSTI: N68-31918

The kinetics and chemical peculiarities of the slow nitration reaction between propane and nitrogen dioxide were studied under static conditions in a vacuum apparatus. The determination of reaction orders was performed by observing the relationship between the initial reaction speed, and the concentration of one of the reactants, with constant concentration of the other reactant. The speed of the reaction was determined photometrically from the consumption of the nitrogen dioxide; the development of the reaction was determined from the logarithmic curve of the relationship between the initial reaction speed and the partial pressures of propane and nitrogen dioxide. The orders of the slow reaction were found to be temperature dependent: at 225 and 250 deg, the order according

to C3H8 was 1.0: at 300 and 350 deg, the order according to C3H3 was 0.75 and according tc NO2, 1.6. The effective activation energy of the reaction was 30,000 plus cr minus 2000 cal/mol at 200-350 deg. At 250 deg, the end products of the slow reaction were nitro-alkanes which underwent further transformations at 350 deg. Intermediate products of the slow reaction were acetaldehyde, isopropyl alcohol, and methyl nitrite. Acetone was formed by secondary reactions; it did not experience any further transformation.

11771

Vogh, J. W. and B. Dimitriades

EFFECT OF HC/NOX RATIO ON PHOTOCHEMICAL REACTIVITY OF AUTO EXHAUST. Preprint, ((17)) p., April 9-14, 1967. (Presented at American Chemical Society, Div. of Water, Air, and Waste Chemistry, Miami, Fla., April 9-14, 1967.)

An attempt to define the reactivity-HC-NOx relationship quantitatively failed to produce conclusive results because of lack of adequate precision. The contention is expressed that at the present time laboratory data are the best source of information available to evaluate control efforts. Furthermore, agreement among various laboratories, i.e. various experimental systems, provides the only criterion for judging the validity and usefulness of the laboratory data. The precision of the reactivity-measurement results is determined by factors other than those associated with the analytical methodology. Humidity variation might be an important factor. On this basis humidity control in irradiation-chamber work is imperative. At extremely low hydrocarbon levels there are indications that significant photochemical oxidant levels would still be produced. A detailed study of the photochemical reactivity of hydrocarbon/NOx systems as a function of concentrations of HC and NOx at levels below 0.2 ppm would be of interest. (Authors' summary, modified)##

11783

Liu, Benjamin Y. H. and Hsu-Chi Yeh

EFFECT OF PRESSURE AND ELECTRIC FIELD ON THE CHARGING OF AEROSOL PARTICLES. (SECTION III). Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering, AEC Contract AT(11-1)-1248, Pub. COO-1248-13, 57p., Sept. 1967. 12 refs. (Presented at the International Conference on the Universal Aspects of Atmospheric Electricity 4th, Tokyo, Japan, May 13-18, 1968.)

The electric charge acquired by particles of an aerosol containing unipolar gaseous ions was measured over a wide range of conditions. Monodisperse aerosols of Di-octyl phthalate with surface median radii from 0.026 to 0.565 micron were used. Pressure was varied from 0.075 atm to 0.96 atm, the intensity of the applied electric field was varied from 372 volts/cm to 2000 volts/cm, and the

product N(o)t was varied from approximately 400,000 to 30,000,000, where N(o) is the concentration of ions in number of ions per cc of air, and t is the charging time in seconds. The experimental data were compared with various charging theories previously reviewed by Liu and Yeh and the results indicated that none of the theories gave an entirely satisfactory account of the experimental data over its entire range. However, the best agreement was obtained with the theory of Liu and Yeh, thus indicating that this theory gives an essentially correct description of the charging process. (Author abstract modified)

11784

Liu, Benjamin Y. H. and Hsu-Chi Yeh

ON THE THEORY OF CHARGING OF AEROSOL PARTICLES IN AN ELECTRIC FIELD. Minnesota Univ., Minneapolis, Particle Technology Lab., AEC Contract Pub. COO-1248-12, 32p., Sept. 1967. 12 refs.

Theories for the charging of aerosol particles by unipolar gaseous ions were reviewed and a new theory taking into account both the random thermal motion of the ions and the motion of ions induced by an applied electric field was developed. The theories were compared with the experimental data of Hewitt; the results indicated that the new theory developed shows the best agreement with the experimental data over the entire range of conditions covered by the data, for particle size ranging from 0.09 to 0.46 micron radius, for electric field intensities ranging from 300 volts/cm to 10800 volts/cm, and for product N(o)t, ranging from approximately 1,000,000 to 50,000,000, where N(o) is the concentration of ions in number of ions per cc, and t is the charging time in seconds). The methods of predicting the magnitude of electric charge acquired by aerosol particles are of considerable practical importance in the design and operation of devices such as electrostatic precipitators, electrostatic aerosol samplers, electrogasdynamic power generators, and aerosol particle counters and classifiers based on electrostatic principles. (Author abstract modified)

11796

Pullman, Ira

FREE RADICAL PRODUCTION IN BIOLOGICALLY SIGNIFICANT COMPOUNDS. In: Biological Effects of Radiation and Related Biochemical and Physical Studies. (Progress Report). Sloan-Kettering Inst. for Cancer Research, New York, Div. of Biophysics, AEC Contract AT(30-1)910, 2p., Sept. 30, 1968.

A method is described for obtaining values of the hyperfine coupling constants of the negative ions of selected polycyclic hydrocarbons of biological interest. The electron spin resonance spectra of these compounds are too complex to be completely resolved, so it is difficult to assign unambiguous coupling

constants based on comparison with a theoretical stick program in which the lines have zero width. In an experimental program, a simulated Lorentz line shape experimental spectrum is being computed by an IBM 1800 from a given set of coupling constants. The natural line width, the modulation amplitude of the spectrometer, and the output time constant of the spectrometer are taken into account. The method reduces the ambiguity in the assignment of coupling constants. Experimental and calculated hyperfine coupling constants for benzo(a)pyrene negative ion are tabulated. The data to be obtained for different hydrocarbon negative ions will serve as a check on various semi-empirical correlations between spin densities and coupling constants reported for the simpler hydrocarbons.

11802

Umans, R. S., S. A. Lesko, Jr., and P. O. P. Ts'o

CHEMICAL LINKAGE OF THE 3,4-BENZPYRENE TO DNA VIA FREE RADICAL REACTION. (A PRELIMINARY REPORT). AEC Contract AT(30-1)-3538, NYO-3538-11, Conf.-681016-2, 6p., March 1, 1968. 3 refs.

A linkage between 3,4-benzpyrene (BP) and DNa was successfully induced by iodine. Chromatographic analysis of the nucleotides produced by hydrolysis of the BP-DNA complex indicated that a majority of the counts followed the optical density, although there was a radioactivity peak in the fractions which came through with the void volume. Since most of the counts were removed by cyclohexane, they are not chemically linked to the nuclectides. It is hypothesized that the BP-DNA bond may be base labile, and thus cleaved by the alkaline conditions needed for enzymatic hydrolysis. This would lead to a free BP derivative in aqueous solution, far above its aqueous solubility, and the formation of microcrystals or colloidal particles. At present, the nature of the BP-DNA reaction product is not clear. Preliminary sucrose gradient electrophoresis studies on the nucleotide mixture indicates several components. One very strong peak of radioactivity is found to migrate closely with the guanosine monophosphate, suggesting that a reaction analogous to alkylation of DNA occurs and involves the 7-position of guanine. In future experiments, the role of free radicals in the reaction will be followed by electron spin resonance.

11864

S.W. Benson, G.R. Haugen

A SIMPLE, SELF-CONSISTENT ELECTROSTATIC MODEL FOR QUANTITATIVE PREDICTION OF THE ACTIVITION ENERGIES OF FOUR-CENTER reactions . Preprint, Stanford Research Inst., Menlo Park, Calif., 27p., 1965. ((46)) refs. (Presented at the Fall 1965 Meeting of the Amer. Chem. Soc. in Atlantic City, N. J.)

The Benson-Bose, semi-ion pair model of the transition state for four-center reactions is extended to include the metathesis

reactions as well as the addition reactions, X2 + olefin yields product, and HX + olefin yields product. A simple electrostatic model of point dipoles is used which permits direct calculation of the activation energies of these reactions. These calculated values agree with a large number of experimental data to within plus or minus 1.3 kcal/mole on the average and a maximum deviation of 3.2 kcal/mole. It was found that the best fit could be obtained by using rX-X + 0.4 angstroms as the transition state distance for all X-X bonds, where rX-X is the ground state X-X distance. The dipole separation is obtained by adding 1.00 angstroms to the rX-Y distance where X-Y is the bond being formed. This leads to a physically reasonable as well as a self-consistent model. Values are given for about 40 reactions involving H, F, Cl, Br, I. A simple point charge correction is included to account for the Markownikoff Rule. Attention is directed to the astonishingly low energies required tc produce semi-ion pair states in olefins and the consequences for olefins chemistry. (Authors' abstract)##

11872

Fatiadi, A. J.

OXIDATION PRODUCTS OF PERYLENE. National Bureau of Standards, Washington, D. C., TN-427, p. 12-16, Oct. 1967. 6 refs.

Pure reference compounds of perylene, particularly the various oxidation products, were needed in connection with a study of the products resulting from photochemical reactions of perylene adsorbed on various particulates. The preparation of 1,12-perylenequinone and 4,9-dihydroxy-3,10-perylenequinone are described. The 1,12-dione was obtained by a published procedure involving cyclization of 2,2'-dihydroxy-1,1'-binaphthyl with aluminum chloride, to give 1,12-perylenediol which was then oxidized with air and lead dioxide to give crude 1,12-perylenequinone. This process was not very efficient, as the desired dione is a labile compound which is difficult to purify. Preliminary values for peaks in its ultraviolet and visible spectra are given in a table. Preparation of 4,9-dihydroxy-3, 10-perylenequinone involved heating a solution of 3,4,9,10-tetranitro-perylene in concentrated sulfuric acid at 140 C for six hours. The product was recrystallized from nitrobenzene to give lustrous, blue crystals, melting at 483-485 C (with sublimation and some decompostion). Preliminary values for peaks in its ultraviolet and visibe spectra are given in a table.

11888

A. A. Borisov

THE THERMAL DECOMPOSITION OF N2C AT HIGH TEMPERATURES. ((Termicheskoye razlozhenye N2C pri vysokikh temperaturakh.)) Text in Russian. Kinetika i Kataliz, 9(3):482-489, 1968. 12 refs.

Changes in the concentration of N2O, N2, O2, and NO with time during the decomposition of N2O (2 or 5% in neon) behind reflected shock waves in a percussion tube at 1800-2300 degrees K were determined using a time-flight mass spectrometer. The system of differential equations describing the kinetics of this reaction was solved, and values were determined from experimental data for the reaction constants of the reactions: N2O + M = O + M, N2O + O = N2 + O2, and N2O + O = 2NO. The rates of the 2nd and 3rd reaction were found to be equal, and the relative heights of the peaks for NO and O2 were found to remain constant during the entire reaction period, independent of pressure and temperature. The concentration of NO increased uniformly with time. Although both N2/N2O and O2/N2O increased with time, the value of the ratio N2/O2 decreased rapidly during the first 100 microseconds, indicating an initial predominance of the first of the 3 equations. The reaction rate for this catalytic decomposition is about 100 times as high as that for the other two reactions.##

11959

Zocher, H. and H. Kautsky

LUMINESCENCE DURING CHEMICAL REACTIONS. Naturwissenschaften (Berlin), vol. 11:194-199, 1923. 10 refs. Translated from German. 14p.

Chemiluminescence of the silicalhydroxide Si2O2H2 was studied and the simultaneous occurrence of fluorescence was established. Studies of temperature effect from 100 C to -86 C were made. The chemiluminescence as well as fluorescence is explained on the basis of quantum considerations. Studies were made of the chemiluminescence reaction of oxydisilin with potassium permanganate as revealed through the fluorescence of a number of attendant pigments.

11965

Goehring, H. and I. Darge

A PROCESS FOR DETERMINING SULFATE IN THE PRESENCE OF SOME DISTURBING CATIONS. (Ein Verfahren zur Bestimmung von Sulfat bei Anwesenheit einiger stoerender Katicnen). Z. Anal. Chem., vol. 125:180-184, Nov. 9, 1942. 10 refs. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 9p.

A method is described for separating disturbing cations, such as Ca(II), Fe(III), Al(III), or Cr(III), from a sulfate-containing solution by means of a synthetic resin exchanger. Resins which are themselves strongly acid because they contain aromatic nuclear sulfo acid groups and can therefore exchange metal ions for hydrogen ions appear especially suitable for this purpose, as in the reversible reaction CaSO4 plus H2 exchanger yields H2SO4 plus Ca exchanger. Sulfate solutions can be completely

freed from disturbing cations by filtering them over the exchanger, provided the solution is not too strongly acid (pH value of at least 1.5). The sulfate ion is not retained by the exchanger in quantities which can still be detected by the usual analytical methods. Separation by this technique is rapid and convenient and of satisfactory accuracy.

12041

Glueck, A. R. and C. N. Kenney

THE KINETICS OF THE OXIDATION OF SULPHUR DIOXIDE OVER MOLTEN SALTS. Chem. Eng. Sci., 23(10):1257-1265, Oct. 1968. 14 refs.

Kinetic experiments on the oxidation of SO2 over molten potassium pyrosulphate at temperatures below 380 degrees C in the presence of V2O5 are discussed. The rate of reaction is first order in SO2 and zero order in oxygen partial pressure. The velocity constant is 1.0 x 10 to the minus 7 mole cm/2 atm/1 sec/1 at 377 degrees C and the activation energy is 10.8 kcal. Possible mechanisms are given. (Author's Abstract) ##

12046

Kistiakowsky, G. B. and T. A. Walter

PHOTOLYSIS OF KETENE BY 2139-A RADIATION. J. Phys. Chem., 72(12):3952-3958, Nov. 1968. 27 ref.

The photolysis of ketene by the radiation of mainly 2139-A wavelength was investigated over a wide range of ketene pressures and radiation intensities in a static system. The effects of small additions of oxygen and of large excess of n-butane was also studied. The quantum yield of CO formation in ketene alone is about 2 and is nearly or completely pressure independent. The other main product is ethylene, whose quantum yield is about 0.8. Smaller yields of H2, C2H2, and C2H6 were also obtained, and their dependence on pressure and radiation intensity was studied. Also several C3 and C4 hydrocarbons are formed whose yields increase with the degree of decomposition, so that they are attributed to reactions with the primary products of photolysis. A polymer film is slowly formed on the irradiated surfaces of the cells. The experimental results are consistent with the conclusion that the primary reaction is the decomposition of ketene into CO and CH2. About 70% of the methylene formed reacts with ketene forming CO and C2H4. It is suggested that a small portion of the latter is so "hot" that it dehydrogenates into C2H2 and H2. It is further proposed that the remainder (about 30%) of methylene abstracts a hydrogen atom from ketene forming CH3 and CHCC radicals. These then form the ethane, about 60% of the acetylene, and about 17% of ethylene at the highest radiation intensities used. At lower intensities, especially, some first-order reactions of these radicals probably occur which might lead to the formation of the polymer. With an excess of n-butane the main reaction (about 70%) appears to be an

insertion of methylene, forming pentanes. Also CH4, C2H6, and butenes are observed which are attributed to an abstraction reaction by methylene to form CH3 and C4H9 radicals. When oxygen is added to ketene alone or to mixtures of ketene and n-butane, all products which have been attributed to free-radical reactions disappear. These results make it probable, although they do not prove it, that the 2139-A radiation causes the formation of two kinds of methylene in about a 7:3 ratio, which behave kinetically as the singlet and triplet states of methylene formed by near-ultraviolet radiation but possess higher excess energy. (Author's Abstract)##

12142

Stevenson, H. J. R., D. E. Sanderson, and A. P. Altshuller

SOME EFFECTS OF SULFUR DIOXIDE ON FORMATION OF PHOTOCHEMICAL AEROSOLS. Preprint, American Industrial Hygiene Assoc., Detroit, Mich., 14p., 1964. 13 refs. (Presented at the Conference of the American Industrial Hygiene Association, Philadelphia, Pa., April 29, 1964.)

Aerosol was photochemically produced by the irradiation of a number of hydrocarbon-nitrogen dioxide mixtures, some requiring sulfur dioxide. In the reactions not requiring sulfur dioxide, the addition of SO2 increased the aerosol production. Trans-2-butene required SO2 for aerosol production, but cyclohexene did not. When both hydrocarbons were present in the photochemical reaction with NO2, the amount of aerosol was greater than that produced by the cyclohexene alone. The cyclohexene appeared to perform a role for the trans-2-butene similar to the role played by sulfur dioxide. Six- and seven-carbon olefins, whether cyclic or straight chain, all produced aerosols without the presence of SO2 and produced more aerosol when SO2 was added. It appeared reasonable that 3-heptene produced less aerosol than the 1-heptene in the absence of SO2 because of the smaller molecular fragment on reaction. The 3-heptene reacted more rapidly than the 1-heptene because of the internal position of the double bond, and the increase of aerosol on addition of SO2 was greater for 3-heptene than for 1-heptene. Shorter wavelength illumination had little effect, an indication that photochemical activation of SO2 is not responsible for its ability to react in photochemical smog production. At 50% humidity, less aerosol was produced than at 0%, and the length of residence time had opposite effects on the quantity of aerosol produced, depending upon the speed of the reaction. The size of the aerosol produced depended upon the conditions of the experiment. When sulfur dioxide was present, the aerosol was smaller and more numerous.

12169

J. N. Pitts, Jr., and J. K. S. Wan

THE PHOTOCHEMISTRY OF KETONES AND ALDEHYDES. Preprint, California Univ., Riverside, Dept. of Chemistry, 103p., Dec., 1964. 272 refs.

With the development of modern experimental techniques, particularly in analysis of complex mixtures by liquid-gas chromatographic methods, photochemistry has assumed an increasing importance in studies of free radical reactions, energy transfer processes and the synthesis of new and unique organic compounds. Perhaps the most widely studied class of compounds, historically and today, is that containing the carbonyl chromophore. The absorption spectra of most carbonyl compounds fall in the experimentally readily accessible region of the ultraviolet where quarts has high transmission and mercury arcs produce strong ling emission spectra. In order to obtain a thorough understanding of the photochemistry of a given system, one must elucidate the entire "life history" of the photoprocess; this includes the primary process (es) and all secondary reactions in the system.##

12171

Downs, Alan R.

ATMOSPHERIC TRANSMISSION OF LIGHT FOR CLEAR AIR AND FOG IN THE SPECTRAL REGION 0.35 TO 1.10 MICRONS. Ballastic Research Labs. Aberdeen Proving Ground, Md., RDT and E Proj. 1M523801A286, BRL MR-1561, 45p., April 1964. 12 refs.
CFSTI, DDC: AD 444333

A method for determining light transmission in an ideal atmosphere with humidity ranging from 0.1 to 100 times ten to the minus 6 g/cu cm at -40 to +60 C over path lengths of 1000 to 5000 m is described. Horizontal light paths near sea level and wavelength intervals of 0.05 micron over the range 0.35-1.10 micron were used. Modification of the model to account for the presence of fog is explained. Transmissions are given for varying amounts of fog over path lengths up to 200 m. This same method does not apply to haze because of small droplet size and consequent wavelength dependence; hence visual approximation are substituted.

12216

Wells, Michael E.

MONTE CARLO ANALYSIS OF SEARCHLIGHT SCATTERING MEASUREMENTS. Radiation Research Associates, Inc., Fort Worth, Tex., CAR Contract F19628-67-C-0298, Proj. 7621, Task 762107, Unit 76210701, AFCRL-68-0311, RRA-T87, 17p., May 31, 1968. 5 refs. (Presented at the Annual Meeting of the Optical Society of America, 1967, Paper ThD 20.)
CFSTI, DDC: AD 675153

A Monte Carlo analysis was made of measurements of the scattered light from a searchlight beam. These measurements, reported by Elterman, were performed to determine the aerosol properties of the atmosphere for altitudes below 35 km. Elterman derived altitude profiles of the aerosol attenuation coefficient from the measured response data by use of single scattering theory for

Rayleigh and aerosol particle scattering. A study was made using the LITE-I Monte Carlo code to investigate the effects of multiple scattering and ozone absorption on the measured response date for 0.55 micron wavelength light. The effect on the calculated receiver response that results from the use of different aerosol phase functions in the Monte Carlo calculations was also studied. The Monto Carlo calculations showed that the effects of multiple scattering and ozone absorption were approximately equal in magnitude, but opposite in effect. It was concluded, that the neglect of ozone absorption and multiple scattering did not introduce any significant error in Elterman's calculations of the aerosol attenuation coefficient profiles. The major source of error in determining the aerosol attenuation coefficient profile from single scattering theory was found to be in the use of an aerosol phase function that was measured at a different time and geographical location than that used for the searchlight experiment. (Author abstract modified)

12259

A. Hayhurst, and T. Sugden

IONIZATION PROCESSES, CONNECTED WITH ADDITION OF METALS TO GAS FLAMES. In: Low-Temperature Plasma (Selected Articles). Translated from Russian. Foreign Technology Div., Wright-Patterson AFB, Ohio, p. 9-29, June 21, 1968. 17 refs.

An experimental study of the ionization processes in hot products of combustion process (flame gases) as weak plasma media is presented. Among the topics discussed are the physical and chemical properties of flames, mass spectroscopic observations, electron concentration measurements and thermal and chemical ionization. The experimental techniques, which effectively combine electron concentration measurements with direct mass spectroscopy, are described. Direct collisional ionization of metallic elements, hydrated postiive ion formation, and mutual ionization be electron exchange are the phenomena observed in the weak plasmas of flame gases.##

12320

Altshuller, A. P., S. L. Kopczynski, D. Wilson, W. Ionneman, and F. D. Sutterfield

PHOTOCHEMICAL REACTIVITIES OF PARAFFINIC HYDROCARBON-NITROGEN OXIDE MIXTURES UPON ADDITION OF PROPYLENE OR TOLUENE. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Div. of Chemistry and Physics, 16p., 1969. 8 refs.

Effects associated with photochemical air pollution including nitrogen dioxide and oxidant dosages, yields of formaldehyde and peroxyacetyl nitrate, and eye irritation response, were measured during irradiation of n-butane - nitrogen oxide or n-butane - ethan - nitrogen oxide mixtures, with small amounts of propylene or toluene added. In some mixtures, propylene was added to n-butane

to give hydrocarbon ratios ranging from 0 to 0.25 to 1; in others, toluene was added to provide a hydrocarbon ratio of 0.5 to 1. Irradiations were carried out in two 335-cu ft chambers, with 6-hr periods of static irradiation. Beneficial effects resulted from selective changes in hydrocarbon composition as well as from reduction of total hydrocarbon concentration. Exclusion of olefins and alkylbenzenes was highly effective in reducing oxidant dosage, formaldehyde and peroxyacetyl nitrate concentrations, and eye irritation response. The only negative results was a modest increase in nitrogen dioxide dosage. A large reduction in nitrogen oxide concentration reduced nitrogen dioxide dosage and eye irritation response, but resulted negatively in a large increase in oxidant dosage. The results indicate that control of the photochemical aspects of air pollution can be accomplished more rapidly by preferential reduction of olefins and alkylbenzenes than by reduction of total hydrocarbon concentration. It is recommended that research and development efforts be directed toward preferential hydrocarbon control by mechanical or catalytic control devices or by modifications in fuel composition. (Author abstract modified)

12419

Gay, B. W. and J. J. Bufalini

NITRIC ACID: FORMATION BY PHOTOOXIDATION OF HYDROCARBONS IN THE PRESENCE OF OXIDES OF NITROGEN. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Div. of Chemistry and Physics, 4p., 1969. 5 refs.

Ethylene was photooxidized in the presence of nitrogen dioxide under static conditions. Light intensity was measured by NO2 photolysis. Colorimetric analyses were made for NO2 initially and throughout the irradiations with the modified Griess regeant. Nitric acid was also analyzed colorimetrically by the reduction diazotization method. Ethylene, carbon monoxide, were monitored by a gas chromatograph. Nitrogen was analyzed by vapor-phase chromatography on a molecular sieve column with a helium photoionization detector. After several experiments it became obvious that molecular nitrogen was not formed. When 21 ppm ethylene was irradiated for 5 hrs with 3.75 ppm NO2, 25.6 ppm carbon was reacted. The products observed were 10.24 ppm CO; 3.9 ppm CO2; 10.7 ppm CH2O; and 0.3 ppm methyl nitrate. The total carbon observed was then 25.14 ppm. This value represents an excellent carbon balance and indicates that nitrogen cannot coexist with carbon to form a compound. Analyses were than made for nitric acid in the gas phase; none was detected. The inner surface of the flask was washed with 200 ml of 0.1N sodium hydroxide, and an aliquot was used CC determine nitrate by reduction diazotization. This analysis yielded a nitrate concentration of 3.46 ppm. The total nitrogen was 100% accounted for as nitrates. Experiments were extended with the irradiation of 1,3-butadiene. Carbon balance was not good. Nitrogen balance was excellent, with most of the nitrogen again appearing on the walls of the reaction vessel. Although no complete mechanism was suggested, a reaction particularly attractive was N2O5 + H2O(wall) yields 2HNO3 (wall).

13002

Simecek, A., E. Kadlec, and J. Michalek

THE REDUCTION-OXIDATION MECHANISM OF SULFUR DIOXIDE OXIDATION ON VANADIUM CATALYSTS. J. Catalysis, 14(4):287-292, Aug. 1969. 9 refs.

It is shown that the oxidation of SO2 on vanadium catalysts proceeds according to the oxidation-reduction mechanism. The validity of this mechanism was verified by a study of the oxidation rate dependence on the vanadium concentrations and kinetic measurements in two different types of industrial catalysts. It was found that the oxidation rate of sulfur dioxide is a first order one with respect to the total concentration of vanadium in the catalyst. Other results of this study, including temperature dependence and the reaction rate, are presented graphically or in tabulated form. (Author abstract modified)

13009

Eastman, E. D.

REVISION OF THE FREE ENERGY OF FORMATION OF SULPHUR DIOXIDE. Dept. of Commerce, Bureau of Mines, I.C. 6454, 7p., April 1931.

Greater accuracies in the measurement of the heat of formation of SO2 and the specific heat of S gas allow a new and more accurate determination of the free energy of SO2. The equations for the specific heats of rhombic S, gaseous S, O, and SO2, required for the calculation, are given. The heat capacity of S gas was previously taken to be equal to that of O, but is given separate treatment in the present determination. When the characteristic frequency of vibration of a diatomic molecule in the lowest state is known, it is possible to represent its vibrational specific heat approximately by means of the corresponding Einstein function. In the case of S gas, the first quantum jump in vibration is approximately known from calculations based on spectral data. Taking this jump as 0.089 volt-equivalent, the corresponding Einstein function gives the vibrational heat capacity for any temperature. The total heat capacities are then obtained by adding the desired values to 7/2 R, the molal heat capacity at constant pressure of a diatomic gas with rotational degrees of freedom fully excited. The basic free energy equation is obtained from this data and the oxidation reactions of both rhombic and gaseous S. The integration constant is determined from previous equilibrium studies on H2O vapor, liquid S, H2S, and SO2 systems. The three revised equations are given. The revised free energy of formation of SO2 is given as -79,580 cal. This is recommended for temporary and immediate use, but may be subject to further correction when the thermodynamics of the reaction Cu2S = 2Cu2O yields 4Cu = SO2 has been satisfactorily discussed.

13020

Lortie, J.

COMPUTER EVALUATION OF TOTAL OZONE OBSERVATIONS. Ann. Geophys., 25(1): 335-339, 1969. 2 refs. (Presented at the Tenth International Ozone Symposium, Monaco, Sept. 2-7, 1968.)

A Fortran IV computer program has been developed to quality control and calculate routine total ozone measurements and lamp tests for the Dobson Ozone Spectrophotometer. Sky and cloud nomograms are fed to it in the form of numerical arrays which can be easily amended. Further, it sets up files of correct data for research as well as a continuous record of lamp test results to monitor instrument stability. (Author abstract)

13034

Weaver, E.E., J.S. Ninomiya, L.M. Skewes, and C.H. Ruof

OXIDATION OF GASEOUS HYDROCARBONS IN CONCENTRATIONS OF PARTS PER MILLION IN FLOW SYSTEMS. OXIDATION OF 1-BUTENE IN TYPE 410 STAINLESS STEEL TUBES. Environ. Sci. Technol., 3(1):57-62, Jan. 1969. 6 refs.

1-Butene was oxidized in concentrations of 7 to 350 ppm in 90% nitrogen-10% oxygen blends flowing laminarly in fresh and aged Type 410 stainless steel tubes with residence times of 0.10 to 0.25 sec at temperatures between 450 and 800 C. In the fresh tubes, the reaction appears to be largely homogeneous, since nearly identical oxidation rates are obtained in tubes of different diameters and hence of different surface-volume ratios. However, on prolonged use the tubes become increasingly catalytic, showing an order of magnitude increase in rates of oxidation; simultaneously, the surface area of the tube increases by an order of magnitude as shown by BET measurements. The rates of disappearance of the 1-butene approach first-order with respect to hydrocarbon concentration as the tubes are aged; they become independent of oxygen concentration when about 20 times the stoichiometric amount of oxygen is present. (Author abstract modified)

13085

Billard, Francois, Jean Bricard, Michel Cabane, and Ingo Wilmanns

A STUDY OF THE MOBILITY OF SMALL POSITIVE IONS IN AIR BY THE METHOD OF PASSAGE TIME. (Etude de la mobilite des petits ions positifs dans l'air par la methode du temps de vol). Text in French. Compt. Rend. Acad. Sci. Ser. B (Paris), 267(2):112-115, July 8, 1968. 5 refs.

The spectrum of mobility of small positive ions produced by

coronal discharge in air gives rise to a series of maxima in which the mobilities depend on the aging time of the ions, as well as on the impurities of the air. Mobility values were in good agreement with those obtained for small radioactive ions in air. Maximum values were in agreement with those determined in purified gases. For a given aging time, the introduction of either sulfur dioxide or water vapor causes a displacement of the spectrum toward lower mobilities and successive disappearance of the higher mobilities.

13223

Adrussow, Leonid

THE CATALYTIC NITRIC OXIDE REDUCTION AND AMMONIA OXIDATION (IV). (Uber die katalytische Stickoxyd-Reduktion und Ammoniak-Oxydation (IV)). Text in German. Chem. Ber., vol. 60:536-540, 1927. 13 refs.

For further clarification of the ammonia oxidation which was studied in three earlier works, it seemed desirable to also study the reverse process, i.e., the reduction of nitric oxide to ammonia. For this purpose, a mixture of nitric oxide and hydrogen was passed with constant speed over a Pt screen catalyst. After a period of 50 to 80 min required to establish equilibrium, the vessels for the analysis were connected. Ammonia was absorbed by distilled water in the apparatus and a constant flow of oxygen for oxidation to NO was added. The nitric oxides thus obtained were absorbed in sodium hydroxide and frozen with liquid air. Compared to the rapid oxidation of ammonia, the effect of molecular hydrogen on nitric oxide with a platinum catalyst is rather sluggish even at contact times 1000 times as long. Even at the high temperature of 850 C, half of the nitric oxide passed the catalyst without dissociation. Prolonging the contact period from 0.001 sec to 0.006 and 0.003 sec lead to a 90% reduction of the nitric oxide. Between 600 and 650 C, a considerable amount of nitrogen formed, due to the dissociation of ammonia product. Without a catalyst, the effect of hydrogen on nitric oxide remains sluggish even at high temperatures.

13224

Manchot, W. and Hans Schwid

THE STUDY OF METAL NITROSO COMPOUNDS: A NITRIC OXIDE COMPOUND OF MANGANESE. (Zur Kenntnis der Metall-Nitroso-Verbindungen: Uber eine Stickoxyd-Verbindung des Mangans). Text in German. Chem. Ber., vol. 59:2360-2363, 1926. 3 refs.

A nitric oxide compound of manganese was prepared for the first time. $MnCl_2$ is brought in contact with potassium cyanide in aqueous or 30% alcohol solution, nitric oxide is rapidly absorbed. The amount of nitric oxide absorbed depends on the quantity of potassium cyanide used. As systematic experiments showed marked NO absorption took place beginning with

13020

Lortie, J.

COMPUTER EVALUATION OF TOTAL OZONE OBSERVATIONS. Ann. Geophys., 25(1): 335-339, 1969. 2 refs. (Presented at the Tenth International Ozone Symposium, Monaco, Sept. 2-7, 1968.)

A Fortran IV computer program has been developed to quality control and calculate routine total ozone measurements and lamp tests for the Dobson Ozone Spectrophotometer. Sky and cloud nomograms are fed to it in the form of numerical arrays which can be easily amended. Further, it sets up files of correct data for research as well as a continuous record of lamp test results to monitor instrument stability. (Author abstract)

13034

Weaver, E.E., J.S. Ninomiya, L.M. Skewes, and C.H. Ruof

OXIDATION OF GASEOUS HYDROCARBONS IN CONCENTRATIONS OF PARTS PER MILLION IN FLOW SYSTEMS. OXIDATION OF 1-BUTENE IN TYPE 410 STAINLESS STEEL TUBES. Environ. Sci. Technol., 3(1):57-62, Jan. 1969. 6 refs.

1-Butene was oxidized in concentrations of 7 to 350 ppm in 90% nitrogen-10% oxygen blends flowing laminarly in fresh and aged Type 410 stainless steel tubes with residence times of 0.10 to 0.25 sec at temperatures between 450 and 800 C. In the fresh tubes, the reaction appears to be largely homogeneous, since nearly identical oxidation rates are obtained in tubes of different diameters and hence of different surface-volume ratios. However, on prolonged use the tubes become increasingly catalytic, showing an order of magnitude increase in rates of oxidation; simultaneously, the surface area of the tube increases by an order of magnitude as shown by BET measurements. The rates of disappearance of the 1-butene approach first-order with respect to hydrocarbon concentration as the tubes are aged; they become independent of oxygen concentration when about 20 times the stoichiometric amount of oxygen is present. (Author abstract modified)

13085

Billard, Francois, Jean Bricard, Michel Cabane, and Ingo Wilmanns

A STUDY OF THE MOBILITY OF SMALL POSITIVE IONS IN AIR BY THE METHOD OF PASSAGE TIME. (Etude de la mobilite des petits ions positifs dans l'air par la methode du temps de vol). Text in French. Compt. Rend. Acad. Sci. Ser. B (Paris), 267(2):112-115, July 8, 1968. 5 refs.

The spectrum of mobility of small positive ions produced by

a KCN concentration of 1 mole and increased with higher potassium cyanide quantities. At 5 moles KCN, a maximum of one mole NO per atom of manganese was absorbed. In one experiment, a pink precipitate formed in addition to the colored permanganate solution. As more potassium cyanide was added, no further precipitation was obtained; there was only a clear solution whose color intensity increased with higher NO binding at higher quantities of potassium cylanide. The experiments also showed that NO binding is irreversible. With aqueous solution, NO consumption is lower than with alcohol, particularly at lower KCN concentrations, and more precipitate forms. To prepare the compound, 4.90g Mn acetate, one mole H2O, and 3.92g potassium acetate are dissolved in 10 cc water over a water bath. After cooling, 30 cc alcohol are added. Then, in a nitric oxide atmosphere, 6.5g (5 mol) potassium cyanide in 15 cc water is added at 0 C or at room temperature. A considerable but varying amount of gray-green KMn(CN)3 forms, while the solution turns purple. After several precipitating and filtering operations, about 1 to 2 g of crystallized pure substance is obtained. The results of the analyses show complete agreement with the experiments on nitric oxide binding by MnC12 and potassium cyanide mixtures. Manganese is neither oxidized nor reduced. The compound corresponds to the sodium nitroprusside of Fe(II).

13248

Minkh, A. A. and I. N. Malysheva

THE EFFECT OF IONIZED AIR ON THE FUNCTIONAL MOBILITY OF THE SKIN COLD RECEPTORS. (Vliyaniye Ionizirovannogo Vozdukha na funktsional'nuyu mobil'nost' kholodovykh retseptorov kozhi). Text in Russian. Vestn. Akad. Med. Nauk SSSR (Moscow), 24(3): 35-40, 1969. 30 refs.

Artificially ionized air has a broad range of nonspecific action finding its expression in an increased resistance of the organism to oxygen deficiency, chronic effects of toxic dusts and gases, bacterial intoxication, gamma irradiation, etc. The chilling actions of negatively ionized air was studied by determining the "functional mobility" of dermal cold receptors in 30 sportsmen. Functional mobility implies the ability of an organ to react to excitations of the external or internal environment with a larger or smaller number of elements composing it. The phenomenon is inherent in all organs and tissues. A statistically significant drop in the level of functional mobility was observed in the course of 18 to 19 daily exposures to negative aeroions, indicating reduced sensitivity of the skin to cold. Reduced functional mobility may be regarded as one of the indicators characterizing adaption of the organism to cold. Periodical inhalation of negative aeroions should facilitate acclimatization to low-temperature environmental conditions. (Author summary modified)

13253

Jansen, Lena and Olof Samuelson

OXIDATION OF LIGNIN BY POLYSULFIDE SOLUTIONS. Svensk Papperstid., 70(19):607-609, Oct. 15, 1967. 5 refs.

Alkali lignin was subjected to polysulfide cooking and the changes in the concentrations of polysulfide, thiosulfate, and sulfide were determined after various times of reaction. From these changes it can be concluded that dissolved alkali lignin was oxidized by polysulfide during an early stage of the cooking. Sulfide formed in this reaction was partly consumed in reactions with the lignin. Only a minor part of the polysulfide sulfur was under the applied working conditions, decomposed by disproportionation into thiosulfate and sulfide. (Author abstract)

13265

Pierce, J. A.

A STUDY OF THE REACTION BETWEEN NITRIC OXIDE AND HYDROGEN SULPHIDE. J. Phys. Chem., 33(1):22-36, Jan. 1929. 15 refs.

The conditions of the reaction between nitric oxide and hydrogen sulfide were studied at temperatures between 28 and 100 C. Reaction conditions varied by conducting a series of experiments in, (a) a plain glass chamber, (b) with added silica gel, and (c) with added glass wool. The reaction proceeded under all conditions; the slowest velocity was obtained when no catalyst was used. Increased surface provided by glass wool accelerated the reaction to a rate comparable to that with silica gel. The reaction is heterogeneous, as confirmed by the slowing of the reaction in the presence of inhibiting colloidal sulfur. The stoichiometric expression for the reaction is: 2NO + 2H2S yields 2H2O + 2S + N2. A negative temperature coefficient was found and ascribed to decreased association of NO to form N2O2 at the higher temperatures. The accumulation of colloidal sulfur as a result of the reaction is the cause of the inhibitory effect observed. It appears to be a mechanical coating of the catalyst. The glass wall of the reaction chamber and the filaments of glass wool were acted upon by water and H2S with formation of amorphous silicon dioxide. (Author summary modified)

13267

Karp, I. N., B. S. Soroka, L. N. Dashevskiy, and S. D. Pis'mennaya

COMPUTER CALCULATION OF THERMODYNAMIC EQUILIBRIUM OF THE COMBUSTION PRODUCTS OF METAL-OXIDANT MIXTURES. (Raschety termodinamicheskogo ravnovesiya produktov goreniya metano-okislitel'nykh smesey na elektronno-vychislitel'nykh mashinakh). Text in Russian. Akad. Nauk SSSR, Teplofiz. Vysokikh Temp., 5(1):69-78, 1967. 15 refs.

Development of a system of equations for describing thermodynamics equilibrium for the combustion products of a metal-oxidant mixture, and suitable for machine computation, is examined. Results for calculations are presented for the following parameter ranges: temperature, 1600-4000 K; pressure, 1-3 bar;

oxidant excess ratio, 0.4-2.0; degree of oxygen enrichment, from pure air to pure oxygen. This method may be used to determine optimum combustion conditions. This article is condensed from a report given at the All-Union Conference on the Thermophysical Properties of Substances, Odessa, September 1964.

13273

Gerhardt, Bernt and Wolfgang Wiessner

ON THE LIGHT-DEPENDENT REACTIVATION OF PHOTOSYNTHETIC ACTIVITY BY MANGANESE. Biochem. Biophys. Res. Commun., 28(6):958-964, 1967. 9 refs.

It has been established that reactivation of photosynthetic activity by manganese requires light. The necessity of light for the reactivation is not due to a light-dependent manganese uptake. It was found that if Anacystis nidulans cells are preincubated with manganese in the light or dark, subsequent illumination leads in both cases to reactivation. If, however, the cells are freeze-dried after preincubation with manganese, the reactivation takes place only when the algae have been preincubated in the light. These results indicate the necessity of the photosystem II to restore photosynthetic activity in manganese-deficient Anacystis by manganese. It is believed that Mn(2+) must be oxidized in a light-dependent process. The dependency of reactivation on different wavelengths characteristic of photosystem II is presented in tabulated form.

13312

Schonfeld, E.

COMPUTER CALCULATED CONCENTRATIONS IN THE REACTIONS OF NITROGEN AND OXYGEN. J. Chem. Educ., 45(3):173-175, March 1968.

The efficiencies of the reaction of nitrogen and oxygen to form NO at high temperatures and the further oxidation of NO to NO2 at low temperatures can be calculated as a function of the initial gas composition, temperature, and pressure. Three computer programs were developed to perform all the computations. The first one computed equilibrium constants for all the reactions as a function of temperature. The input values to the program were the thermodynamic values that can be obtained from tables. The second and third computer programs solved the equilibrium concentrations of the high temperature reactions and low temperature reactions, respectively. These programs permitted the determination of the equilibrium yields of NO and NO2 as a function of temperature, pressure, and initial conditions (for any N/O atom ratio). The computer programs were written in Fortran.

13324

Hayakawa, Taro, Masahiro Hirashima, Minoru Hamada, and Masahiko Koike

EFFECT OF VARIOUS BIVALENT CATIONS AND CHELATING AGENTS ON THE OXIDATIVE DECARBOXYLATION OF ALPHA-KETO ACIDS. Biochim. Biophys. Acta, 123(3):574-576, Dec. 1966. 8 refs.

The effects of several bivalent cations and ethylenediaminetetraacetic acid (EDTA) on the oxidative decarboxylation of alpha-keto acids in pig heart pyruvate dehydrogenase and 2-oxoglutarate dehydrogenase complexes and Escherichia coli pyruvate dehydrogenase and 2-oxoglutarate complexes are reported. Special attention is given to the activating effect of Ca(2 plus) and Mg(2 plus) cations, as well as the inhibitory effect of EDTA. Tabulated data show that all complexes, except E. coli pyruvate dehydrogenase, were strongly stimulated by Ca(2 plus); Mg(2 plus) had a similar effect, while EDTA inhibited the pig heart pyruvate dehydrogenase complex and both E. coli complexes, but not the pig heart 2-oxoglutarate complex. Indications that firmly bound metal ions play a role in the oxidative decarboxylation of alpha-keto acids were verified by spectrophotometric determination of the protein-bound metals in both pig heart complexes. Highly purified pyruvate dehydrogenase complex contained 0.98 millimicromoles of Mg(2 plus) and 1.6 millimicromoles of Ca(2 plus) per mg of protein, and the 2-oxoglutarate dehydrogenase complex contained 1.7 micromoles of both Mg(2 plus) and Ca(2 plus) per mg of protein.

13327

McKenna, J. M. and N. I. Bishop

STUDIES ON THE PHOTOOXIDATION OF MANGANESE BY ISOLATED CHLOROPLASTS. Biochim. Biophys. Acta, 131(2):339-349, March 1967. 21 refs.

The photooxidation of manganese by isolated spinach chloroplasts was investigated to determine the possible relationship of this reaction to that of the normal Hill reaction. Comparable kinetics were observed for the effects of light intensity and temperature. The photooxidation of manganese is inhibited by typical poisons of Photosystem II, i.e., 3-(3,4-dichlorophenyl)-1, -1-dimethylurea, simazine, and sodium cyanide. Removal of light petroleum-soluble components from chloroplasts decreases their capacity for manganese oxidation. This effect is partially reversed by the addition of plastoquinone A. Several additional components of chloroplasts were examined for their effects on manganese oxidation. Photosynthetic pyridine nucleotide reductase, purified ferredoxin, and a chloroplast diaphorase were ineffective at low concentration and inhibitory at high concentrations. Flavin mononucleotide (FMN), at low concentrations, causes a marked stimulation of manganese oxidation. Both the normal and FMN-stimulated reaction is

inhibited by the flavin-antagonized acriflavin. The requirement for flavin, the need for oxygen in the photooxidation of manganese, and the observed inhibition by cyanide, suggest that peroxide is a product of the reaction and that peroxidase, and perhaps catalase, stimulates manganese oxidation through the removal of the newly formed peroxide. Although the photooxidation of Mn(2 plus) to Mn(3 plus) is dependent upon reactions of photosystem II, it cannot be concluded that the process is exclusively a photosystem II reaction. (Author summary modified)

13341

Ashmore, P. G. and B. P. Levitt

THERMAL DECOMPOSITION OF NITROGEN DIOXIDE. Res. Correspondence, 9(6):S25-S26, June 1956. 3 refs.

Unusually high initial rates were observed for the thermal decomposition of nitrogen dioxide at low pressures near deg C. The decomposition reaction followed second order kinetics and therefore the graph of 1/NO2 against time should be linear. With runs at higher pressures, however, the slope reached a constant value rapidly. This non-linearity was completely suppressed by the addition of an equal pressure of nitric oxide. Nitrogen did not have the same effect, even at pressures up to 0.5 atm. A reaction scheme involving the NO3 radical was suggested to explain these results.

13354

Stopperka, K., F. Wolf, and G. Suss

INVESTIGATIONS INTO THE REACTIONS BETWEEN NITROGEN DIOXIDE AND SULFUR DIOXIDE IN THE GAS PHASE. (Untersuchungen uber die Umsetzung zwischen Stickstoffdioxid und Schwefeldioxid in der Gasphase). Text in German. Z. Anorg. Allgem. Chem., 359(1/2): 14-29, June 1968. 21 refs.

After revieving earlier work on nitrogen dioxide/sulfur dioxide reactions, it is concluded that the catalytic action of water was never properly investigated. In the present work, the gas phase interaction between NO2 and SO2 at H2O partial pressures of 0.005 Torr and 0.000001 Torr and temperatures up to 230 C were manometrically investigated. At an H2O partial pressure of less than 0.000001 Torr, the reaction started at 225 C according to the equations: 2 NO2 yields 2 NO plus O2; 2 SO2 plus O2 yields 2 SO3; and 2 SO3 plus NO2 plus NO yields (NO)2S2O7. In the presence of water vapor at a partial pressure less than 0.005 Torr, the reaction 3 NO2 plus 2SC2 plus H2O yields 2 HOHSO4 plus NC proceeds rapidly even at 25 C. An equilibrium between N2O3 and NO2 plus NO is established. After all water is consumed, the reaction doesnot stop, but it changes to the following: 3 N2O3

plus 2 SO2 yields (NO)2S2O7 plus 4 NC, and NC plus 3 NO2 plus 2 SO2 yields (NO)2S2O7 plus 2 NO. During all reactions, the walls of the vessels were covered by hard, white crystals which were identified as (NO)2S2O7 with admixtures of NOHSO4. Since this reaction is important for gypsum-sulfuric acid plants, other catalysts were investigated. Glass wool, Pt-asbestos, rust, and V2O5 did not influence the reaction other than as water carriers. The apparatus used is described and the compound (NO)2S2O7 was identified by its melting point and Debye pattern.

13364

Garibyan, T. A., A. A. Mantashyan, and A. B. Nalbandyan

FORMATION OF PEROXIDE RADICALS DURING PHOTOCHEMICAL OXIDATION OF HYDROCARBONS. (K obrazovaniyu perekisnykh radikalov pri fotokhimicheskom okislenii uglevodorodov). Text in Russian. Army Khim. Zh. (Erevan), 22(4):285-287, 1969. 3 refs.

A previously described apparatus for electron paramagnetic resonance determination of radicals formed from hydrocarbons was modified to determine whether the peroxide radical was formed from the free alkyl radical according to the equation R plus O2 yields RO2 or heterogeneously on the cold surface. It was shown that the peroxide radicals were formed just in the zone of the gas phase reaction.

13374

Siedlewski, J.

THE MECHANISM OF CATALYTIC OXIDATION ON ACTIVATED CARBON. THE CONTRIBUTION OF FREE CARBON RADICALS IN THE IRREVERSIBLE ADSORPTION OF HYDROGEN SULFIDE. Intern. Chem. Eng., no. 5(2): 293-296, April 1965. 15 refs. (Also: Roczniki Chem., no. 9:1355-1360, 1964).

An investigation of the contribution of free carbon radicals to the irreversible adsorption of H2S was prompted by an earlier study indicating that the number of free radicals on the surface of carbon does not change as the result of the adsorption of H2S. Determination of the electron paramagnetic resonance spectra of (1) pure carbon in a vacuum, (2) carbon with irreversibly adsorbed molecules of H2S, (3) carbon with irreversibly adsorbed molecules of H2S plus O2, and (4) pure carbon plus O2 has lead to the conclusion that the irreversibly adsorbed H2S protects the free radicals from contact with oxygen. Adsorption of oxygen by a carbon sample whose surface contained irreversibly adsorbed H2S does not cause any changes in the magnitude of the electron paramagnetic resonance signal, but oxygen adsorbed directly by a sample containing radicals causes complete disappearance of the signal. Since both the free radicals and the irreversibly adsorbed H2S cover only a relatively small surface of the carbon, it is suggested that the radicals are the active

locations on the carbon surface that irreversibly adsorb H2S. The results also indicate the impossibility of the oxidation of the H2S molecules by molecular oxygen.

13375

Tkach, Yu. A. and O. K. Davtyan

STUDIES ON THE MECHANISM OF OXIDATION, HYDROGENATION AND ELECTROCHEMICAL COMBUSTION ON SOLID CATALYSTS. VI. CONCERNING THE ACTIVE CENTERS AND THE APPEARANCE OF THE OXYGEN POTENTIAL ON CARBON. (Issledovaniye mekhanizma okisleniya, gidrirovaniya i elektrokhimicheskogo goreniya na tverdykh katalizatorakh. VI. Ob aktivnykh tsentrakh i o vozniknovenii kislorodnogo potentsiala na ugle). Text in Russian. Zh. Fiz. Khim. 35(12): 2727-2735, 1961. 5 refs.

The occurrence of oxygen transfer from nonactive to active centers and back again through surface migration on a carbon black electrode (catalyst) until the establishment of equilibrium was demonstrated. Migration rate was found to increase with temperature. The formula of O. K. Davtyan, which gives the dependence of electrode potential on degree of filling of active centers of the chemisorbed substance, was experimentally substantiated for the case of oxygen chemisorption on a carbon black electrode. This supports the proposition that electrode potential is determined not only by the chemisorbed gas in general, but by the electrochemically or chemically active chemisorbed gas constituting some fraction of the total adsorbed gas. The number of active centers on the carbon black surface was determined by the low-temperature oxidation of SO2. The value found was 3.358 times 10 to the 18th power per sq m, which is in good agreement with the value of 4.107 times 10 to the 18th power per sq m obtained the Daytyan formula. These data also indicate a correlation between chemically and electrochemically active oxygen on carbon black.

13376

Siedlewski, Janusz

MECHANISM OF CATALYTIC OXIDATION ON ACTIVATED CARBON. IV. INFLUENCE OF FREE RADICALS OF CARBON ON SO2 ADSORPTION. (Mechanizm katalitycznego utleniania na weglu aktywowanym. IV. Wplyw wolnych rodnikow wegla na adsorpcje SO2). Text in Polish. Roczniki Chem., 38(10):1539-1547, 1964. 29 refs.

The catalytic influence of activated carbon on the oxidation of SO2 to SO3 and the role of carbon free radicals in this reaction were studied. Three different carbon samples were prepared from saccharose at various temperatures and free radical concentrations. It was found that the amount of SO2 adsorbed depends on the surface area of the adsorbent, and not on its porous structure or free radical concentration. However, the amount of chemisorbed SO2 depends only on the number of

free radicals present. The oxygen on a carbon sample which contains chemisorbed SO2 does not change the EPR signal, but oxygen on a pure carbon sample causes the signal to disappear completely. Thus it was concluded that the carbon free radicals are the active centers for the chemisorption of SO2. The bonds between the chemisorbed molecules and the carbon surface, in which the free radicals participate, are relatively weak and break during desorption at 70 C.

13392

Addison, W. E. and R. M. Barrer

SORPTION AND REACTIVITY OF NITROUS OXIDE AND NITRIC OXIDE IN CRYSTALLINE AND AMORPHOUS SILICEOUS SORBENTS. J. Chem. Soc., Part 1, p. 757-769, 1955.

Zeolite-induced reaction processes occurring in an intracrystalline environment were investigated by observing the sorption and reactivity of nitrous and nitric oxide in crystalline sorbents (chabazite, mordenite, faujasite and the synthetic zeolite Na-A) and amorphous sorbents (porous glass, Doucil, and silica gel). All sorbents were outgassed for 24 hr at indicated temperatures, and first characterized and compared by a study of oxygen and argon sorption. The affinity between oxygen and the sorbent varied according to the cation present. Nitrous oxide was sorbed much more strongly than oxygen or argon so its sorption was studied between -78 and 350 K. Both chabazite and mordenite were effective in bringing about the reaction 4NO equals N2O3, but intracrystalline nitrate and nitrite reduced the sorption activity of chabazite. Disproportionation of sorbed nitric oxide was noted in the reactivity of sorbed nitric oxide towards oxygen. Findings indicate striking differences between zeolites acting as disproportionation catalysts and the relatively feeble catalysts observed with siliceous gel sorbents. It was concluded that an intracrystalline environment promotes reactivity.

13407

Gehlen, Heinz

ON THE REACTION AND PROPERTIES OF NITRIC OXIDE AND ITS COMPOUNDS. II. STUDIES OF THE SALTS OF NITRIC OXIDE-SULFUROUS ACID. (Ueber Reaktionen und Eigenschaften des Stickoxyds und seiner Verbindungen, II. Mitteil.: Zur Kenntnis der Salze der stickoxyd-schwefligen Saeure.) Text in German. Chem. Ber., 65:1130-1140, 1932. 19 refs.

While the alkali salts of nitric oxide-sulfurous acid, e.g. K2SO4.N2O (2HONHSO3K plus 2KOH plus O yields K2SO4.N2O plus K2SO3 plus 3H2O), had been studied in detail, the corresponding heavy metal salts could not be obtained. But the reaction between heavy metal salts and K2SO4.N2O yields double salts, some of which are described here. The salt K2SO4.N2O was prepared by the reaction of nitric oxide gas with potassium sulfite. A

reaction of this alkali salt with zinc sulfate produced K4Zn(SO4,N2O)3. Similarly, K4Co(SO4,N2O)3, K4Mn(SO4,N2O)3, and K2Cd(SO4,N2O)2 were obtained. The coloration of aqueous solutions of these double salts indicates complex formation. Addition of sulfuric acid destroys the color, while K2SO4.N2O restores it. The decomposition temperatures were determined. The chemical analysis of the four double salts is briefly described. The thallium salt Tl2SO4.N2O, was also prepared. The absorption rates of nitric oxide on the sulfites of thallium, lithium, sodium and potassium were also studied, and no differences in the rates were found. The homologous compounds, i.e., the selenites and tellurites, cannot absorb nitric oxide in alkaline solution. It is proposed that the easy and complete decomposition of K2SO4.N2O be used for the preparation of N2O. Nitrous oxide was determined by the explosion method after mixing with hydrogen.

13408

Williams, Harry D.

CELLULOSE SOLUTIONS IN DIMETHYL SULFOXIDE AND NITROGEN DIOXIDE. Du Pont De Nemours (E. I.) and Co., Wilmington, Del. U. S. Pat. 3,236,699. 3p., Feb. 22, 1966. 5 refs. (Appl. April 19, 1963, 9 claims).

The invention describes the economical preparation of homogeneous solutions of cellulose which can regenerate cellulose products without the use of carbon dioxide or sodium hydroxide. It has applications for the manufacture of textile fibers and transparent films. Solutions are prepared by adding about 1.0-1.7 parts by weight of liquid nitrogen dioxide per part by weight of cellulose to a slurry of cellulose and at least four parts dimethyl sulfoxide per part cellulose until a substantially homogeneous solution is obtained. Preferably, the reaction should be carried out at 20-40 C. Precipitation is effected at an aging temperature below 60 C by dilution in an aqueous medium containing at least 50% by weight of water. The medium can contain sodium chloride, sodium sulfate, magnesium chloride, potassium sulfate, or other dissolved salts. Cellulose esters can be prepared by adding the anhydride of the corresponding organic acid and an optional acidic catalyst such as sulfuric acid, to the solution of cellulose and nitrogen dioxide in dimethyl sulfoxide.

13412

Gregg, S. J.

ACTIVE SOLIDS. In: The Surface Chemistry of Solids. Reinhold Publishing Corp., New York, N. Y., 1961, Chap. 7, p. 300-328. 51 refs.

Where a laboratory or an industrial process involves the interaction of a solid with a gas, liquid or another solid, the nature of the reaction will depend on the chemical composition of the solid, but its rate will be determined by the type of pretreatment of the

solid. Characteristics associated with activity appear when the specific surface of a solid is at least 1 square meter/gram. The surface contributing to the activity of the solid is the whole of that surface which is accessible to the molecules of the substance that is interacting with it. The methods of preparing active solids are aimed at developing large surface areas and producing an increased concentration of lattice imperfections. Fine grinding is the most obvious way of attempting to increase the area of a compact solid. The converse process is condensation, where the particles of the active solid are produced by aggregation of the ions, atoms of molecules of the parent substance; this may be accomplished by precipitation from solutions, condensation from the vapor phase, or in the preparation of evaporated metal films. The active solid will tend to lose its activity as soon as it is formed, essentially by a process of sintering. All the correct conditions required for preparing a solid, including time and temperature of heating, suitable starting materials, and the presence or absence of impurities are not yet known.

13415

Haseba, S., T. Shimose, N. Kubo, and T. Kitagawa

NITRIC OXIDE EXPLOSION. Chem. Eng. Progr., 62(4):92-96, April 1966. 8 refs.

A method was found to analyze low-concentration hydrocarbons assumed to have contributed to an explosion in the second heat exchanger of a nitrogen wash unit. Acetylene, 1,3-butadiene, and allene existed in the crude gas in the order of 2 to 3 ppm, 0.2 to 0.5 ppm, and 0.2 to 0.3 ppm, respectively. Nitric oxide was detected at concentrations in the order of 0.005 to 1 ppm through oxidation with permanganate and sulfuric acid, followed by calorimetric detection with the Griess-Saltzman reagent. Findings showed that more than 90% of NO entered the unit accumulated in the second heat exchanger, most of it oxidized to nitrogen dioxide and nitrous anhydride, which is more reactive with hydrocarbons than NO. Experiments confirmed the possibility of spontaneous ignition in the second exchanger and the composition of reaction products between nitrogen and conjugated dienes. An adsorption process is now used to remove NO, in which Na2CrO2 or C12 are added to the wash-water circuit.

13417

Spealman, M. L. and W. H. Rodebush

THE REACTION OF SOME OXIDES OF NITROGEN WITH ATOMIC OXYGEN AND NITROGEN. J. Am. Chem. Soc., 57(8):1474-1476, Aug. 1935. 6 refs.

Laboratory observations of the reaction NO2 plus O equals NO plus O2, indicated a reaction probability of .00001 per collision at 40 deg. The reactions N plus NO2 equals 2NO, and N plus NO equals N2 plus O are shown to be fairly rapid. It is further reported that the reaction NO plus O equals No2 probably takes place by triple collision, and is accompanied by an oxygen afterglow.

13448

Beattie, I. R. and S. W. Bell

DINITROGEN TRIOXIDE. I. STABILITY IN THE GASEOUS PHASE.
J. Chem. Soc., p. 1681-1686, 1957. 9 refs.

By means of an all-glass apparatus, where all possible greases either reacted with or absorbed nitrogen oxides, the equilibrium between nitrogen dioxide, dinitrogen tetroxide, nitric oxide, and dinitrogen trioxide was studied in the gas phase at 5, 15, 25, 35, and 45 deg. The equilibrium constant at each temperature was determined over a wide concentration range, so thermodynamic constants can be obtained by extrapolation to zero pressure. Variations occurring in k2 were attributed to non-ideality of the gases, sorption, or variations in k1. Extrapolated values of k2 at various temperatures, obtained by the least squares method, yielded a value of 9527 plus or minus 96 cal/mole for the heat of reaction. The corresponding entropy change for the reaction was 33.25 plus or minus 0.35 cal/mole/deg.

13452

Clough, P. N. and B. A. Thrush

FORMATION OF VIBRATIONALLY EXCITED N2O IN THE REACTION OF N ATOMS WITH NO2. Discussions Faraday Soc., No. 44:205-207, 1967. 7 refs.

Nitrogen dioxide was added to active nitrogen from a microwave discharge to learn if vibrational excitation characterized the newly formed bonds of the polyatomic reaction products N2O plus O plus 42.4 kcal. At 0.5 mm, Hg, emission of v1 plus v3 and v2 plus v3 was found, but at 0.05 mm Hg the intensities of bands involving v1 and v2 were found to be greatly reduced relative to those involving only v3, demonstrating the collisional redistribution of energy from v3 to v1 and v2. When total pressures were raised, there was no evidence of either 2v3 or v2 plus v3, and it was concluded that less than 10% of the molecules formed with stretching vibrational energy have any excitation of v2. The failure to detect excitation of the bending vibration v2 suggests a "repulsive" type of surface where the energy is released during product separation.

13454

Dunnicliff, H. B., Sardar Mohammad, and Jai Kishen

THE INTERACTION BETWEEN NITRIC OXIDE AND HYDROGEN SULPHIDE IN THE PRESENCE OF WATER. J. Phys. Chem. Vol. 34:1721-1734, 1931. 18 refs.

The reactions of nitric oxide and hydrogen sulfides in the presence of water, ammonium nitrite, ammonium sulfide, or ammonium

thiosulfate were studied and their products were determined and measured. Nitric oxide reacted with hydrogen sulfide solution giving ammonium nitrite, ammonium thiosulfate, sulfur, nitrous oxide, and nitrogen. An ammonium sulfide solution was decomposed by nitric oxide to give polysulfides of ammonium and small amounts of ammonium thiosulfate and nitrous oxide and nitrogen were evolved. Excess of the reducing agent gave pure nitrogen, but excess of the oxidizing agent increased the yield of nitrous oxide. Saturated hydrogen sulfide solution completely reduced nitrous oxide to nitrogen and ammonia, and slowly converted ammonium nitrite into ammonia and small amounts of nitrogen. Nitric oxide slowly converted dilute solutions of ammonium thiosulfate into ammonium sulfate and nitrogen.

13457

Hartree, E. F.

A COMPARISON OF HORSERADISH PEROXIDASE AND MANGANESE IONS AS CATALYSTS FOR THE OXIDATION OF DIHYDROXYFUMARIC ACID. Biochem. J., Vol. 107:581-587, 1968. (25) refs.

With horseradish peroxidase as catalyst the main product was dihydroxytartrate, but small amounts of glycolaldehyde, mesoxalic semialdehyde, mesoxalate and possibly glyoxal were also formed. Catalysis by Mn(2I) gave rise only to mesoxalate and oxalate. When oxygen uptake was followed by a manometric method, the rate of the peroxidase-catalyzed reaction was proportional to oxygen concentration and marked inhibition by cyanide was obtained only at low buffer concentration. The catalytic effects of peroxidase and Mn(2I) were almost always additive. Chelating agengt inhibited the Mn(2I)-catalyzed reaction, but had either no effect or a slight accelerating effect on the peroxidase-catalyzed reaction. It is concluded that Mn(23) does not function as confactor in the peroxidase-catalyzed oxidation. (Author abstract modified)

13484

Kleinert, Theodor N.

STABLE FREE RADICALS IN VARIOUS LIGNIN PREPARATIONS. Tappi, 50(3): 120-122, March 1967. 23 refs.

Electron spin resonance (ESR) spectra of lignin preparations isolated from spruce wood by various methods, and of a few synthetic lignin-like polymers produced from coniferyl alcohol by enzymatic dehydrogenation or mild oxidation, were recorded and compared. The specimens exhibited single-line signals (first derivatives) without noticeable fine-splitting. However, the amounts of stable free radicals present, as indicated by the signal areas, varied, probably indicating differences in the stabilizing capacity of lignins prepared by different methods. At room temperature, no significant changes in the ESR spectra were observed when the specimens were stored for extended periods of time. Apparently,

the presence of stable macroradicals or free-radical centers in the specimens, as indicated by the ESR signals, is evidence that free radical reactions have taken place during the specimen preparation. (Author's abstract modified)

13489

Gordon, A. R.

THE FREE ENERGY OF SULPHUR DIOXIDE. J. Chem. Phys., 3(6):336-337, June 1935. 25 refs.

The heat of formation of SO2 from diatomic sulfur and oxygen was calculated from the calorimetric heats of formation of sulfur dioxide and hydrogen sulfide. The free energy for SO2 formation at 289.1 K was determined. Equilibrium constants for the reactions 1/2S2(g) +O2 = SO2, and SO + 1/2O2 = SO2 are tabulated for the range 298.1 to 2800 K. (Author's abstract modified)

13503

Glick, H. S., J. J. Klein, and W. Squire

SINGLE-PULSE SHOCK TUBE STUDIES OF THE KINETICS OF THE REACTION N2 PLUS O2 YIELDS 2NO (2NO YIELDS N2 PLUS O2) BETWEEN 2000-3000 K. J. Chem. Phys., 27(4):850-857, Oct. 1957.

The design of combustors for jet engines, the calculation of the properties of hypersonic flow fields, and the modification and improvement of chemical processes are among the problems requiring data on high chemical reaction kinetics. In the single-pulse shock tube method, developed at the Cornell Aeronautical Laboratory for processing a reactant gas sample with a single closely controlled, high temperature reactant gas, data on high temperature kinetics is obtained by analyzing 'debris' produced by the high-temperature pulse. The kinetics of nitric oxide formed in the temperature range 2000 to 3000 K were studied, using krypton, argon, and a mixture of argon-helium as diluents. The variation observed in the apparent activiation energy for k2 with different diluents indicated that the bimolecular mechanism is not dominant. When experiments were performed at constant room temperature (2580 K), it was observed that k2 varied as the inverse square root of the concentration of air. When an oxygen nitrogen mixture was used at a constant reaction temperature of 2500 K, the k2 varied inversely with the square root of the molecular oxygen concentration parallel Zeldovich's findings. The rate-determining step in the chain is: O plus N2 yields NO plus N, with deltaH2500 deg equals 75.8 kcal/mole. The reactivation energy for this step is 74 plus or minus 5 kcal/mole. The collision cross-section is 10 to the minus 16 power sq cm, which corresponds to a steric factor of about 0.05.

13528

Michailova, E. A.

THE KINETICS OF THE REACTION BETWEEN AMMONIA AND NITRIC OXIDE ON THE SURFACE OF A PLATINUM FILAMENT. Acta Physicochim. USSR, 10(5):653-676, 1939. 16 refs.

Ammonia and nitric oxide were circulated in a closed system at pressures close to 2 cm Hg at 500-530 K. At higher temperatures, self-heating of the platinum wire occurred. Water formed during the reaction was absorbed with potassium hydroxide and partially frozen out with dry ice. The data obtained on kinetics led to the following hypothesis for the reaction mechanism: both reacting gases are well adsorbed on a platinum surface free from adsorbed oxygen; the reaction proceeds between the molecules adsorbed on neighboring elementary spaces, while the reaction products (nitrogen and water) are not adsorbed. The reaction velocity is independent of the pressures of each gas but dependent on the ratio of the pressures. It reaches a maximum at a definite ratio of the pressures of both gases. With equivalent amounts of the gases present, it is constant for the first 50 min. The apparent activation energy for the reaction is 24.8 Kg cal.

13530

Ayen, R. J. and M. S. Peters

CATALYTIC REDUCTION OF NITRIC OXIDE. Ind. Eng. Chem., Process Design Develop., 1(3):204-207, July 1962. 9 refs.

The reaction between nitric oxide and hydrogen was studied at 375,400 and 425 C and 0.005 to 0.05 atm. Temperature measurements were made with thermocouples and a potentiometer. Two important reactions were noted: One mole of nitric oxide and one mole of hydrogen form one mole of water and one-half mole of nitrogen in an equilibrium reaction, and two and one-half moles of hydrogen and one mole of nitric oxide form one mole each of water and ammonia in an equilibrium reaction. Mechanisms were developed for these reactions, and rate and adsorption constants were evaluated from the data for the corresponding rate equations. The controlling mechanism for the first reaction is the combination of one mole of each adsorbed reactant to form water and atomic nitrogen, either directly or through intermediate steps. Hydrogen dissociation appears to be the controlling mechanism in the second reaction. The study's implication for smog-control programs is suggested.

13533

Tandy, G. H.

THE ROLE OF ALKALI SULPHATES IN VANADIUM CATALYSTS FOR SULPHUR DIOXIDE OXIDATION. J. Appl. Chem. (London), 6:68-74, Feb. 1956. 5 refs.

The chemical composition of alkali metal sulfates-vanadium oxide mixtures in equilibrium with sulfur dioxide-sulfur trioxide air mixtures was investigated. Gas mixtures were prepared from a 5% SO2-95% air mixture, the ratio of SO2 to SO3 being maintained at the equilibrium value corresponding to the temperature of each run. Experiments were carried out with mixtures of V2O5 and one alkali metal sulfate (Na, K, Rb, or Cs) at 380-600 deg. From 440 to 600 deg a liquid is formed consisting of vanadium compounds dissolved in an alkali pyrosulfate-sulfate mixture. The melting point of the mixture decreases with increasing atomic weight of alkali metal used. The level of reduction in the V2O5 remains fairly constant from 550-480 deg in the Na2SO4 mixture, from 440-600 in the K2SO4 mixture, and from about 410-520 deg in the rubidium and cesium sulfate mixtures. Below these temperatures there is a marked increase in the extent of reduction of sodium, potassium, and cesium. Thus potassium is more effective in stabilizing the vanadium in the pentavalent state than sodium. Rubidium and cesium are even more effective.

13540

Applebaum, David, Paul Harteck, and Robert R. Reeves

THE CHEMILUMINESCENT NO--O-ATOM REACTION. Photochem. Photobiol., 4(6):1003-1006, 1965. 8 refs.

New experimental data gave further information on the mechanism for the chemiluminescent NO--O-Atom reaction. Results were obtained for the change of emission intensities from 10 to 300 microns pressure. Some studies were also made on the effects of Ar, CO2, He, N2O, O2, and CF4 as third bodies. The results support a simple two body recombination for the mechanism of light emission: NO plus O equals NO2 plus energy.

13545

Jordan, C. W., A. L. Ward, and W. H. Fulweiler

GUM DEPOSITS IN GAS DISTRIBUTION SYSTEMS. VAPOR-PHASE GUM (CONTINUED). Ind. Eng. Chem., 26(10):1028-1038, Oct. 1934. 10 refs.

A study of the effect of the vapor-phase gum accumulating on the adjusting needles of gas pilot lights showed that the amount of gum required to extinguish an ordinary pilot light is 0.000065 g and that the gum is produced by the catalytic oxidation of nitric oxide to nitrogen peroxide followed by the reaction of the peroxide with unsaturated hydrocarbons. Freedom from the vapor-phase gum can be assured only when the quantity of nitric oxide is on the order of 0.000005% or lower by volume. Since combustion products are the principle source of nitrogen oxides, the formation of vapor-phase gum can be controlled at its source. A suggested method of reducing

nitrogen oxides is to reduce the negative pressure on retorts or ovens and to purge combustion products in water-gas sets, thereby producing a blue gas containing less than 3% total nitrogen. Methods involving oil scrubbing and steam spraying had no appreciable effect on nitric oxide.

13546

Stoddart, E. M.

THE REACTION OF PHOSPHORIC ANHYDRIDE WITH NITROGEN DIOXIDE AND WITH NITRIC OXIDE. J. Chem. Soc., p. 1459-1461, 1938.

It was shown that nitrogen dioxide and phosphoric anhydride react at 250 deg to form a glassy compound, P2O5.2NO, with the liberation of oxygen. The compound P2O5.xNO2, previously identified by Smith (J. Chem. Soc., 1928:1886), does not appear to exist. It is clear that when Smith treated his material with water, nitric oxide was evolved but not noticed, in the reaction P2O5.2NO plus H2O yields 2HPO3 plus 2NO, and this gas reacted with the oxygen present to give the brown nitrogen dioxide. The compound P2O5.2NO is also formed by direct union of nitric oxide and phosphoric anhydride. The observations are important in considering the influence of intensive drying on the reaction between nitric oxide and oxygen.

13558

Barrer, Richard M. and William E. Addison

DISPROPORTIONATION OF NITRIC OXIDE USING CRYSTALLINE ZEOLITES AS CATALYSTS. (Union Carbide Corp., New York, N. Y.) U.S. Pat. 2,853,365. 7p., Sept. 23, 1958. 1 ref. (Appl. Feb. 7, 1955, 12 claims.)

A process for disproportionating nitric oxide to form nitrous oxide and higher nitrogen oxides is presented. The nitric oxide is absorbed by partially dehydrated zeolite crystals at a temperature below 0 C. At this temperature, the nitric oxide is decomposed to nitrous oxide and nitrogen peroxide. At 150 C the nitrous oxide is liberated and the nitrogen peroxide forms nitrogen dioxide and nitric oxide. Nitrogen dioxide is liberated by heating the zeolite crystals to 200 C.

13559

Caudle, P. G. and K. G. Denbigh

KINETICS OF THE ABSORPTION OF NITROGEN PEROXIDE INTO WATER AND AQUEOUS SOLUTIONS. Trans Faraday Soc., 49:39-52, 1953. 9 refs.

Experimental measurements were made on the rate of absorption of nitrogen peroxide into water and aqueous solutions of sodium

hydroxide and calcium chloride. The absorption speed was determined as a function of the gas composition, the gas and liquid flow rates, and the temperature. Over a large range of conditions it is found that the absorption rate is a linear function of the concentration of N2O4 in the gas phase. This indicates that the speed of the process is determined by the chemical reaction of N2O4 with water, and not by diffusion. In order to explain the effect of gas and liquid flow rates some tentative new ideas are put forward which represent a departure from the traditional "two film" theory. It is suggested that, at any moment, the whole of a gas-liquid interface is not equally active in absorption, and that the activity of any part is determined by the local conditions of eddying and mixing which, in turn, depend both on the gas and liquid flow rates. Attention is also drawn to the phenomenon of rippling at the interface. (Authors' abstract modified)

13561

Chambers, F. S., Jr. and T. K. Sherwood

ABSORPTION OF NITROGEN DIOXIDE BY AQUEOUS SOLUTIONS. Ind. Eng. Chem., 29:1415-1422, 1937. 24 refs.

The significance of diffusional resistances in the absorption of nitrogen dioxide by water and aqueous solutions of nitric acid or alkali was studied. Nitrogen dioxide was absorbed from a mixture in nitrogen using basic solutions varying from 2.7 to 34.1% NaOH and acid solutions varying from 5.7 to 69.8% HNO3. Similar tests were carried out in a wetted-wall tower and in a batch absorption vessel. The observed absorption rates for NO2 were compared with corresponding evaporation rates of water in the same apparatus. The rate of absorption was greatest for pure water, and much less in strong acid or basic solution. The gas film diffusional resistance was the controlling factor in absorption rate. The results are explained by the hypothesis of reaction in the gas phase, with the deposition of a nitric acid mist in the gas film. New data are presented on vaporization of water, desorption of ammonia from aqueous solution absorption of ammonia by water and acid, and absorption of sulfur dioxide by base in the wetted-wall tower. (Authors' abstract modified)

13564

Johnston, Harold S. and Harvey J. Crosby

KINETICS OF THE FAST GAS PHASE REACTION BETWEEN OZONE AND NITRIC OXIDE. J. Chem. Phys., 22(4):689-692, April 1954. 7 refs.

The rate of reaction between ozone and nitric oxide was measured optically at -43 and -75 deg. A diagram of the apparatus was provided. The stoichiometry of the reaction was established with reactant concentration and temperatures (-45 deg to room temperature) higher than those used for rate studies. Under those

conditions, the rate would have been too fast to follow. The reaction was a very fast second-order process, and the reactants and products were simple molecules of well-known kinetic properties. The mechanism was bimolecular: NO plus 03 yields NO2 plus 02. In view of the low activation energy for this reaction, it was compared to other similar bimolecular processes which have higher energies of activation. There appeared to be no systematic difference in pre-exponential factor between the fast and the slow reactions.

13574

Foster, E. Gordon and Farrington Daniels

RECOVERY OF NITROGEN OXIDES BY SIIICA GEL. Ind. Eng. Chem., 43(4):986-992, April 1951. 10 refs.

Work was undertaken to develop an economical process for the recovery of the 1 to 1.5% nitric oxide produced by a thermal process for the fixation of atmospheric nitrogen which was developed at the University of Wisconsin. Basic data are presented for the dehydration and adsorption steps of a recovery process involving cooling of the product gas from the fixation furnace in a spray tower, dehydration of the gas in silica gel dryers, catalytic oxidation of the NO to NO2, and NO2 concentration by adsorption on and desorption from silica gel. A method for correlation of the rate of NO adsorption on silica gel was of great interest. The effects of silica gel depth, temperature, particle size, and gas velocity on rates of adsorption are described. Diffusion of the adsorbed NO into the solid adscrbent may be the rate-controlling step.

13579

Barker, Maurice E.

CATALYST. U. S. Pat. 1,916,249. 3p., July 4, 1933. (Appl. Sept. 5, 1928, 4 claims).

The invention comprises the formation of alloys of copper, iron, and manganese; copper and manganese; and copper and iron, and the treatment of the alloys to produce the desired catalysts. A catalyst in the form of a porous spongy mass can be obtained by either oxidizing the cast alloy until all exposed surfaces are covered with a coating of the porous mixture or treating the alloy with chlorine gas, hydrochloric acid, or nitric acid and calcining the substances formed. A catalyst in the form of a mixture of oxides can also be prepared by chemical treatment and calcination. If preferred, alloys may first be ground to granular or powder form. Iron and copper alloys have been found to convert carbon monoxide into carbon dioxide at low temperatures and to accelerate the oxidation of sulfur to sulfur dioxide. The addition of manganese is suggested to accelerate the oxidation of carbon and sulfur oxides into higher oxides.

13633

Gehlen, Heinz

ON REACTIONS AND PROPERTIES OF NITRIC OXIDE AND ITS COMPOUNDS. I. ON THE REACTION BETWEEN NITRIC OXIDE AND SODIUM HYDROSULFITE. (Ueber Reaktionen and Eigenschaften des Stickoxyds und seiner Verbindungen, I. Mitteil.: Uber die Einwirkung des Stickoxyds auf Natriumhydrosulfit.) Text in German. Chem. Ber., 64:1267-1276, 1931. 20 refs.

The method of Jellinek for preparing pure sodium hydrosulfite has been improved. By this simple laboratory process, 98.5% pure $Na_2S_2O_4$, free of chloride, can be obtained. Commercially available $Na_2S_2O_4$ can be purified without elaborate filtering. The process is described in detail, including all wet chemical checks for purity. One mole of $Na_2S_2O_4$ in aqueous solution absorbs 4.31 moles of NO. The chemical reactions taking place are: $Na_2S_2O_4$ plus 6NO plus 2NaOH yields $Na_2SO_3.N_2O_2$ plus Na_2SO_4 plus $2N_2O$ plus H_2O; and to a lesser degree, $Na_2S_2O_4$ plus 6NO plus 2NaOH yields $2Na_2SO_3.N_2O_2$ plus N_2O plus H_2O.

13640

Reysig, V. A., S. A. Stadnik, and G. M. Shchegolev

HIGH-TEMPERATURE FIXATION OF NITROGEN OXIDES. (K voprosu o vysokotemperaturnoy fiksatsii okislov azota). Text in Russian. Khim. Vysokikh Energiy, 1(6):587-591, 1967. 12 refs.

Results of numerical solution to a system of kinetic equations describing the change in state of dissociated air as a function of change in temperature and cooling rate are presented. These results are in good agreement with experiments. A method is given for obtaining from calculated data a law of cooling for NO-containing dissociated gases (especially air) which assures maximum hardening (irreversible freezing of reacting gas composition) of nitrogen oxides. The effectiveness of using the slot heat exchanger in plasmochemical processes is demonstrated.

13671

Razumovskii, S. D., A. L. Buchachenko, A. B. Shapiro, E. G. Rozantsev, and G. E. Zaikov

THE FORMATION OF NITROXYL RADICALS IN THE REACTION OF AMINES WITH OZONE. Dokl. Chem., Proc. Acad. Sci. USSR (English Transl.), 183(4-6):1086-1089, Dec. 1968. 9 refs.

It was shown experimentally that nitroxyl radicals are intermediate products in the reaction of ozone with secondary amines. The radicals were identified by electron spin resonance and thin-layer chromatography. The radicals were

capable of further reacting with ozone, whereupon they were converted to non-radical products which did not react with ozone. The kinetics of the accumulation and consumption of nitroxyl radicals and the content of ozone in the effluent gas from the reactor during the interaction of N-phenyl-N-isopropyl-p-phenylenediamine were studied. Other amines studied were diphenylamine and derivatives of oxopiperidine, hydroxypiperidine, butylaniline, and quinoline. It was found that the accumulation of nitroxyl radicals begins in the early stages of ozonation, at which point the rate is maximum. The reaction showed a low activation energy. The reaction mechanism is given in a scheme, based on the experimental results. It was concluded that the first stage of the reaction is formation of the nitroxyl radical, the concentration of which depends on the ratio of the rates of its formation and consumption. In some cases, a quantitative yield of the radical with respect to the amine can be obtained. The previously proposed reaction scheme should be modified to include stages in which nitroxyl radicals are formed and destroyed.

13683

Nobe, Ken and L. L. Wikstrom

CATALYTIC DECOMPOSITION OF NITROGEN DIOXIDE. Preprint, Am. Chem. Soc., Pittsburgh, Pa., Div. Water, Air Waste Chem., 268-273, 1963. 11 refs. (Presented before the Div. of Water and Waste Chem., Am. Chem. Soc., Los Angeles, March 31 - April 5, 1963).

Studies on the catalytic decomposition of NO2 in N2 and in air were carried out with CuO- and CeO2-alumina catalysts at 304 to 520 C at gas space velocities ranging from 1400 to 11,200/hr. With CuO-alumina catalysts and initial NO2 concentrations of 1260 ppm, 99% of the NO2 was dissociated to NO, N2, and O2. At higher flow rates, the conversion varied linearly with the gram weight of the catalyst per flow rate of the reactant in moles per sec, indicating that the rate of dissociation of both NO2 and total nitrogen oxides is zero order. At lower flow rates, the conversion approached a constant value. Specific rate constant values were determined for different temperatures, activation energy, and frequency factor of zero order reactions. At a given temperature, flow rate, and initial concentration, the conversion of NO2 to N2 and O2 in air was less than in N2. No distinct reaction order fits the data obtained for this reaction. CeO2 was more active than CuO between 480 and 520 C, but less active below 480 C. It is assumed that the catalysts selectively adsorbed NO2 on active sites which were on the order of 10 to the 11th power/sq cm.

13684

Durau, Felix

THE ADSORPTION OF GASES ON SODIUM CHLORIDE AND AQUEOUS SODIUM CHLORIDE SOLUTION. (Uber Adsorption von Gasen an Natriumchlorid und wassriger Natriumchloridlosung). Text in German. Ann. Physik, vol. 87:307-384, 1928. 10 refs.

Adsorption of 12 gases on NaCl was studied. For this purpose, NaCl was carefully cleaned and degassed. The liberated gases were analyzed and the NaCl was pulverized in a nitrogen atmosphere. The measurements were taken at pressures below 0.4 mm with a MacLeod gauge and at atmospheric pressures by volumetry. The adsorption isctherms of N2, H2, CO2, O2, and NO on non-heated NaCl were determined, followed by studies of the N2 and CO2 adsorption on NaCl degasses at 480 C. Strikingly, adsorption of CO2 decreased instead of increasing as had been expected. This can be explained by changes of the surface properties. The surface properties were studied in detail by heating pulverized NaCl in CO2, O2, H2, and N2 and by treating it with water vapor. By observation of the saturation pressure of concentrated NaCl solution in the water vapor experiments, it can be concluded that an aqueous solution forms around the individual NaCl crystals, but only part of the surface of this solution adsorbs. With O2, it was observed that adsorption on the solution was irreversible, which explains why it is so difficult to remove water vapor from the surface. In the adsorption of all other gases except water vapor, not even a monomolecular layer formed on the surface. Due to the reversibility of the processes observed with most of the gases, it can be concluded that only adsorption took place without diffusion. Adsorption increased with the boiling point of the adsorbed gas. Adsorption of CO was higher and can be explained by its dipolar character. Adsorption is caused by van der Waal forces and amplified by the dipolar properties of the adsorbed gas. Lattice defects cause higher adsorption owing to their higher energy.

13685

Ganz, S. N. and L. I. Mamon

KINETICS OF FILM ABSORPTION OF NITROGEN(II) OXIDE BY FESO4 SOLUTIONS. (Kinetika plenochnoy absorbtsii okisi azota rastvorami FeSO4). Text in Russian. Zh. Prikl. Khim., vol. 30: 369-375, 1957. 5 refs.

The kinetics of film absorption of NO by FeSO4 solutions was studied experimentally in order to establish the nature of the driving forces of the process as a function of change in sorbent concentration and partial pressure of the absorbing component. It was found that at relatively low concentrations of NO in the gas and a gas flow speed of 0.1-1 m/sec, the NO absorption coefficient increases as the 0.8 power of the gas speed. The total absorption coefficient may be taken equal to the partial coefficient (Kg) along the gas film, since the resistance of the latter is the process-limiting factor. An empirical kinetic equation expressing Kg as a function of the gas Reynolds number is given in dimensionless form and is suitable for designing industrial absorption equipment.

13688

Ganz, S. N. and M. A. Lokshin

EFFECT OF BASIC PHYSICOCHEMICAL FACTORS ON RATE OF ABSORPTION OF

NITROGEN OXIDES BY A SOLUTION OF CALCIUM HYDROXIDE IN MECHANICAL ABSORBERS WITH A LARGE NUMBER OF ROTATIONS. PART II. (Vliyaniye osnovnykh fizikokhimicheskikh faktorov na skorost" absorbtsii okislov azota rastvorom Ca(OH)2 v mekhanicheskikh absorberakh s bol"shim chislom oborotov. Soobshcheniya II). Text in Russian. Zh. Prikl. Khim., 30(10):1525-1535, Oct. 1957. 6 refs.

New data on the effect of basic physicochemical factors on the rates of NO, NO2, and N2O3 absorption by Ca(OH)2 solution are presented. It is established that: absorption rate decreases at temperatures above 45-50 C; an increase in concentration of nitrogen oxides under the hydrodynamic conditions studied leads to acceleration of the absorption process; in the absence of nitrite-nitrate salts, a change in CaO concentration has practically no effect on process rate; in all cases an increase in concentration of nitrite-nitrate salts reduces the absorption rate, an increase in CaO concentration retarding the decrease in absorption rate in this case. It is established that absorption of N2O3 and NO2 proceeds at practically the same rate under turbulent conditions. Preferential accumulation of nitrate salts in the solution indicates rapid oxidation of NO to NO2 taking place in the liquid phase and the occurrence of an inversion process under the experimental conditions used.

13692

Moravietz, W.

THE THERMAL OXIDATION OF IRON SULFIDE WITH SULFUR DIOXIDE TO ELEMENTARY SULFUR. (Die thermische Oxydation von Eisensulfid mit Schwefeldioxyd zu Elementarschwefel). Text in German. Z. Elektrochem., 57(7):539-548, 1953. 11 refs.

Under the influence of SO2 and at higher temperatures, pyrite splits off its sulfur in two steps. The first step is a thermal dissociation. The monosulfide which is formed in this process is oxidized to magnetite in a second step. To determine the equilibrium of the oxidation of FeS with SO2, a sample hung from a scale by a quartz thread was exposed to SO2 whose partial pressure was regulated by adding nitrogen. The quartz glass vessel in which the reaction took place was heated and the temperature was measured by a thermocouple. The scale had a sensitivity of 0.1 mg and could be loaded with a maximum of 200 g. The experiments were performed with temperatures of 620, 720, 820, and 920 C and with SO2 partial pressures of 0.9, 0.5, and 0.1 atm. For equal SO2 partial pressures, the S2 partial pressures yield an almost straight line. Also, the values for the reaction equilibrium yield a straight line at equal SO2 partial pressures. At 0.5 and 0.9 atm SO2 initial pressure, these values are almost the same at equal temperature. At 0.1 atm, however, they are considerably smaller. The reaction speed of the oxidation of FeS in the presence of SO2 is measured on spheres of synthetic FeS. It is determined by the diffusion speed in the pores of the magnetite formed. From the spherical analogue of Fick"s first law, a measured diffusion constant is obtained which agrees well with the theoretical constant computed with a mathematical model and molecular kinetic data.

13719

Siedlewski, J. and S. Trawinski

THE MECHANISM OF CATALYTIC OXIDATION ON ACTIVATED CARBON. THE INFLUENCE OF THE CONCENTRATION OF FREE CARBON RADICALS. Intern. Chem. Eng., 5(2):289-292, April 1965. 8 refs.

The mechanism of the processes taking place on the surface of activated carbon during the catalytic oxidation of H2S and SO2 was investigated. The influence of the concentration of free radicals in the carbon on the adsorption of H2S was studied. All the investigated samples of carbon, regardless of the temperature at which they were prepared, adsorbed the same quantities of H2S at an adsorbate pressure of 760 mm Hg. Carbons containing higher concentrations of free radicals adsorbed considerably more H2S than those with lower concentrations at lower pressures. This indicates that the radical active centers are filled first by the adsorbed substance and are more active than the rest. The number of free radicals on the surface of the carbons did not change as a result of the adsorption of H2S. This indicates that no process connected with the cleavage of the bonds in the adsorbed molecules takes place during the adsorption.

13781

Ross, L. W.

THERMODYNAMICS OF SULPHUR DIOXIDE CONVERSION TO SULPHUR TRIOXIDE. Sulphur, no. 65:37, Aug./Sept. 1966. 4 refs.

The heat, free energy, and equilibrium constant for the conversion of sulfur dioxide to sulfur trioxide were computed and given in a table. Sulfur trioxide data were obtained by computations based on the experimental frequency assignments of Lovejoy, et al. Data on sulfur dioxide and oxygen were obtained from the JANAF tables. The values computed at intervals of 100 K were fitted to an orthogonal polynomial interpolation function of degree eight and recomputed at 25 K intervals. The results differed from those of previous investigations by nearly 20% for some values of the equilibrium constant, although agreement was good in the region of importance.

13786

Kota, S. and A. P. Krueger

AIR ION EFFECTS ON EDTA-INDUCED BLEACHING IN GREEN BARLEY LEAVES. Intern. J. Biometeorol., 12(4):331-342, 1968. 11 refs.

A severe chlorosis or bleaching is observed in the leaf tissues

when green intact barley leaves are floated on the surface of a solution of EDTA (0.05 M, pH 7.0) and exposed to light. This EDTA-bleaching effect can be quantitated in terms of the tissue content of chlorophylls a and b. The EDTA-bleaching effect is weakened by exposing to either negative or positive air ions. The addition of casein hydrolysate (2%) also protects intact green leaves against EDTA-bleaching. This protective effect of casein hydrolysate is significantly augmented by either negative or positive air ions. The leaf tissue content of protochlorophyll is not uniformly affected by EDTA or air ions. A hypothetical mechanism involved in these phenomena is proposed. (Author abstract modified)

13822

Serdyuk, L. S. and A. G. Tabachnikov

THERMODYNAMIC PROPERTIES OF NITRIC OXIDE AT 200-2000 K AND 1000 BAR. (Termodinamicheskiye svoystva okisi azota v intervale temperatur 200-2000 K i do davleniy 1000 bar). Text in Russian. Inzh. Fiz. Zh., 13(1):114-117, July 1967. 4 refs.

A previously derived equation of state was used to calculate molar density, enthalpy, and entropy for nitric oxide at each 100-deg interval from 200 to 1000 K and each 200-deg interval from 1200 to 2000 K for 18 different pressures ranging from 1-1000 bar. Three pages of data are tabulated.

13823

Pozin, M. Ye., V. V. Zubov, L. Ya. Tereshchenko, E. Ya. Tarat, and Yu. L. Ponomarev

SOLUBILITY OF NITRIC OXIDE IN WATER SOLUTIONS OF CERTAIN SALTS. (Rastvorimost' okisi azota v vodnykh rastvorakh nekotorykh soley). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii, Khim. i Khim. Tekhnol., 6(4):608-616, 1963. 16 refs.

Statistical methods were applied to new experimental data on the solubility of NO in water solutions of $CuSO_4$, $CuCl_2$, $MnSO_4$, H_3PO_4, $CoSO_4$, $NiSO_4$, $Cu_2(NH_3)nCl_2$, Na_2SO_3, $FeSO_4$, and $FeCl_2$. Maximum NO solubility under absorption conditions was exhibited by Na_2SO_3, $FeSO_4$, and $FeCl_2$ solutions and ammonia solutions of monovalent copper, the process of NO absorption being reversible in all cases except with sodium sulfate. Solutions of divalent iron salts and of sodium sulfate are seen as industrially important NO absorbers. Equilibrium of the NO - iron salt solution systems at salt concentrations up to 20-30% was studied for the temperature range of 10-90 C. An approximation formula for determining the equilibrium constant for salt concentrations greater than 0.7 g-mole/liter is presented. Nomograms for determining the NO equilibrium pressure in $FeCl_2$ and $FeSO_4$ solutions are plotted.

13843

Mars, P. and J. G. H. Maessen

THE MECHANISM AND THE KINETICS CF SULFUR DIOXIDE OXIDATION ON CATALYSTS CONTAINING VANADIUM AND ALKALI OXIDES. J. Catalysis, 10:1-12, 1968. 17 refs.

The oxidation of SO2 on a sodium-potassium-vanadium catalyst proceeds, as does that of SO2 on a catalyst containing potassium and vanadium, by rapid establishment of the equilibrium SO2 plus 2V(V) plus O2 yields SO5 plus 2V(IV). The rate of the reaction between oxygen and V(IV) is the rate-determining step for the process. On the basis of this finding, a kinetic formula was derived for expressing the reaction rate. When it was checked by means of isothermal and differential kinetic measurements on both types of catalysts, the expression was found to describe correctly measurements at 437 C and above. The values of both reaction rate and equilibrium constants calculated from the kinetic experiments are in good agreement with those derived from analytical determinations. (Author abstract modified)

13889

Jaffe, Sigmund and Fritz S. Klein

PHOTOLYSIS OF NO2 IN THE PRESENCE CF SO2 AT 3660 A. Trans. Faraday Soc., 62(521):2150-2157, May 1966. 16 refs.

Nitrogen dioxide was irradiated at 3660 A in the presence of SO2. Quantum yields were measured as a function of SO2 pressure, and the specific rate constant for O plus SO2 yields SO3 was determined. The ratio of rate constants for the proposed reactions: SO3 yields O plus SO2 and SO3 M yields SO3 plus M, was estimated to be 0.077 mole/l by the combination of the results of quantum yields with those of isotopic oxygen scrambling. A simple, bimolecular dark reaction was also observed.

13894

Mirzoyeva, L. M.

THERMODYNAMIC EQUILIBRIUM COMPOSITION AND THERMODYNAMIC PARAMETERS OF NITROGEN-OXYGEN HIGH-TEMPERATURE REACTION PRODUCTS. (Termodinamicheskiy ravnovesnyy sostav i termodinamicheskiye parametry produktov reaktsil azotno-kislorodnykh smesey pri vysokikh temperaturakh). Text in Russian. Izv. Akad. Nauk Azer. SSR, Ser. Fiz. Tekh. i Mat. Nauk, no 6:70-75, 1967. 8 refs.

Using data from the literature, calculations of composition and thermodynamic parameters were made for nitrogen/oxygen ratios (C) of 1:1 and 1:3 at 2000-6000 K and 1-10 atm. Reaction

is assumed to take place in a plasma column containing a mixture of N2, O2, NO, N, and O. Maximum NO yield was found to occur at about 3500 K for all values of Q. The following dependences are plotted: NO molar fraction vs temperature at 1 atm for both values of Q; NO molar fraction vs temperature with Q of 1 at 1.2 and 10 atm; enthalpy of gas vs temperature for Q of 1 and 1/3 at 1.2 and 10 atm; molecular weight of air and gas vs temperature for Q of 1 and 1/3 at 1.2 and 10 atm.

13895

Rozlovskiy, A. I.

KINETICS AND MECHANISM OF NITRIC OXIDE DISSOCIATION. (Kinetika i mekhanizm razlozheniya okisi azota). Text in Russian. Zh. Fiz. Khim., 30(6):1349-1355, 1956. 15 refs.

Dissociation of nitric oxide is catalyzed in the presence of oxygen in amounts commensurate with NO content. An equation describing the reaction kinetics for any oxygen content is presented, observed regularities being subject to the formation of reaction chains. Initial reaction centers arise through equilibrium dissociation of oxygen at the reaction walls. Over a wide range of experimental conditions, the reaction proceeds with simultaneous chain and bimolecular mechanisms. Observations indicate a constant rate for the bimolecular reaction. These findings contradict those of other Soviet authors requiring a retardation of NO dissociation by oxygen. This contradiction is seen as stemming from an erroneous assumption regarding the ratio of reaction constants for N plus C2 and N plus NO, there being no possible assumption regarding the rate-determining stage which will lead to the need for retardation of the chain reaction by oxygen. A quantitative explanation of explosion experiments with excess oxygen and a qualitative explanation with excess fuel are thus made possible.

13897

Rodionov, A. I., Yu. S. Mishchenko, A. P. Klimov, and E. A. Bogdanov

ABSORPTION OF NITROGEN OXIDES BY LIMESTONE SUSPENSION. (Absorbtsiya okislov azota suspenziyey izvestnyaka). Text in Russian. Tr. Mosk. Khim. Tekhnol. Inst., vol. 40:74-77, 1963. 6 refs.

Absorption of nitrogen oxides by a limestone suspension containing 10-110 g/liter CaCO3 was studied in a sieve-plate bubbling column. The following was observed: an increase in degree of oxidation of the gas from 0.32 to 0.92 increases the degree of absorption from 42-45 to 62-65%; the degree of absorption increases with increased concentration of nitrogen oxides; the degree of absorption is independent of CaCO3 content, but the height of the foamy layer decreases, reducing the resistance of the plate; the degree of NO plus NO2 absorption remains the same when the temperature of the foamy layer is increased from 16 to 58 C.

13898

Chertkov, B. A.

OXIDATION OF CALCIUM SULFITE IN THE EXTRACTION OF SO2 FROM GASES. (Okisleniye sul "fita kal "tsiya v protsesse izvlecheniya SO2 iz gazov). Text in Russian. Zh. Prikl. Khim., vol. 33:1708-1714, 1960. 7 refs.

The rate of oxidation of calcium sulfite formed in the extraction of SO2 from exhaust gases was found to average 9.4 g/sq m-hr with an average oxygen absorption coefficient of 72 g/sq m-hr-atm for the test absorber. The degree of oxidation was found to result from the simultaneous effect of a number of factors influencing mass transfer in the liquid phase (e.g., reflux density, temperature, and composition of reflux solution). It was found that addition of 0.002-0.004% p-aminophenol to the circulating solution has a long-term retarding effect on calcium sulfite oxidation and results in a three to five-fold decrease in sulfate formation.

13900

Harding, John Windsor

KINETICS OF CATALYTIC DECOMPOSITION OF NITRIC OXIDE. Illinois Univ., Urbana, Ph.D. Thesis, Ann Arbor, Mich., Univ. Microfilms, Inc., 1969, 76p. 25 refs.

This thesis presents the results, correlation, and interpretation of an experimental study of the rate of decomposition of nitric oxide on an aluminum oxide catalyst. The constants of the correlations are interpreted in terms of Langmuir-Hinshelwood mechanisms. Experiments were conducted in a different fixed-bed reactor. The reactor was operated at 644 to 807 C with space velocities of 168 to 2280/hr at standard temperature and pressure. Input to the reactor was 10 to 15 mole % nitric oxide diluted with nitrogen or helium. The 0.2 to 2.0% resulting conversion was measured with a photoelectric colorimeter. The rate of decomposition of nitric oxide was correlated as a function of nitric oxide concentration for all results. The mechanism supported by calculations is the reaction of two adjacently adsorbed nitric oxide molecules as the slow step with nitric oxide and nitrogen in equilibrium between gas and adsorbed phases. In this interpretation, nitric oxide is much more strongly adsorbed than nitrogen. After prolonged heating at approximately 740 C, the activated catalyst loses activity, following which the interrelations of the activation energies apparently change, although the form of the rate equation is unaltered. (Author summary modified)

13901

Kuz'minykh, I. N., A. I. Rodionov, and Yu. S. Mishchenko

ABSORPTION OF NITROGEN OXIDES FROM WASTE GASES IN A PILOT PLANT

COLUMN. (Absorbtsiya okislov azota iz khvostovykh nitroznykh gazov v poluzavodskoy barbotazhnoy kolonne). Text in Russian. Tr. Mosk. Khim. Tekhnol. Inst., vol. 33:43-47, 1961. 7 refs.

Data are reported from pilot operation of a sieve-plate bubbling column designed to remove NO and NO2 from waste gases down to the current sanitary norm of 0.1 vol % and using a 10% soda solution as the absorber. Total nitrogen oxide content in the incoming gas was about 0.3%, the flow rate was 1.3 m/sec, and the reflux density was 4.3 cu m/sq m-hr. Foam height was about 35-40 mm with the temperature maintained at 20-25 C. Maximum absorption (about 65-75%) took place at an acidity of 0.5. The degree of absorption did not change appreciably when gas flow rate was increased to 2 m/sec, but the absorption coefficient increased from about 200 to about 300 kg/sq m - hr - kg/cu m. Both degree of absorption and absorption coefficient were independent of reflux rate under the above conditions.

13916

Mirev, D., C. Balarev, L. Bojadziev, and D. Lambiev

III. ABSORPTION OF NITROGEN OXIDES IN THE VIBRATING LAYER OF SODIUM CARBONATE SOLUTIONS. (III. Absorption von Stickstoffoxyden in der vibrierenden Schicht von Natriumkarbonatloesungen). Text in German. Compt. Rend. Acad. Bulgare Sci., 14(4):345-348, 1961. 3 refs.

The absorption of nitrogen oxides in the vibrating layer of sodium carbonate solutions was studied under various conditions. Experiments were made with mixtures of gases containing 0.55 to 1.8% of nitrogen oxides, with a degree of oxidation of 20 to 60%. The effects of the degree of oxidation of NO to NO2, of the oxygen content of the gas mixture, of the rate of flow of the gas stream, of the concentration of the absorbent, and of temperature on the efficiency of separation, expressed as the ratio of the absorbed nitrogen oxides over their initial concentration, were studied. The optimal conditions for implementation of the process were established. The experimental findings are in agreement with the present views of the mechanism of oxidation of NO, according to which it proceeds vigorously on the gas-liquid inter phase. It is shown that with the absorption in the vibrative layer the content of nitrogen oxides in the exhaust gas is considerably lower than with the ordinary process of absorption by barbotage.

13922

Rosenberg, R. E. and D. S. Hacker

FORMATION OF NITROGEN OXIDES IN AERATED METHANE FLAMES. Preprint, Am. Chem. Soc., Washington, D. C., Div. Fuel Chem., 10(3):91-103, 1966. 5 refs.

An investigation to determine the kinetics of the formation of

nitrogen oxides produced in aerated methane flames is discussed. When a bunsen flame was used, NO formed in a narrow region near the outside edge of the flame and then diffused toward the center of the burner and into the secondary air stream where it was oxidized, forming NO2. Very little NO2 was found in the burning gas. Because the shape and position of the reaction zone from a bunsen flame made kinetic analysis difficult, the experimental work was changed to a flat flame. Nitrogen dioxide formed very close to the flame and then rapidly decomposed. Its concentrations decreased to zero with fuel-rich and stoichiometric primary mixtures. However, some NO2 was found at all heights above the burner with fuel-lean primary mixtures. Three observations were drawn from this stoichiometric flame: (1) NO2 is the nitrogen oxide formed in the flame; (2) NO2 decomposes to NO; and (3) NO is also formed by another mechanism in the combustion products above the flame.

13930

Mueller, Ernst and Heinrich Barck

ON THE DECOMPOSITION OF NITRIC OXIDE BY HEATING WITH METALS. (Uber die Zersetzung von Stickoxyd beim Erhitzen mit Metallen). Text in German. Z. Anorg. Allgem. Chem. vol. 129: 309-320, July 19, 1923. 3 refs.

The question of whether small pieces of heated wire of various metals would be useful in reducing nitric oxide was investigated. It was hoped that this process could then be used in the microanalysis of organic compounds. Copper with zinc impurities reduced up to 88% NO at 400 C. Pure Cu reduced only 45% NO. Details of the experiments and method of analysis are given. Reasons for the incomplete reduction and inconsistency in the results are probably due to nitride formation and the production of N2O. Silver does not reduce NO below 700 C. Iron reduces NO better than Cu. Brass reduced nothing below 600 C and 29% at 700 C. Tin is ineffective below 400 C, and above that, nitride is formed. Zinc does not reduce below 350 C, but reduces NO slowly and completely at 600 C. Bismuth produces Be2O3 at 400 C, reducing 73.6% NO. Lead reduces 86.6% at 600 C. Magnesium, Ca, and Al became slowly effective at 600 C. Mn reduces 68% NO at 400 C. Other metals tested were Cr, ferrochromium, lead superoxide, lead oxide, and vanadium trioxide. All quantitative conditions and experimental results are given.

13931

Seery, Daniel J. and Craig T. Bowman

A SHOCK TUBE STUDY OF METHANE OXIDATION. Preprint, Am. Chem. Soc., Washington, D. C., Div. Fuel Chem., 11(4):82-95, 1967. 11 refs.

An experimental study was made on the oxidation of methane behind reflected shock waves to provide information on the reaction

mechanism and chemiluminescence for high temperature oxidation. In this study, pressure, OH, CH, CO, C2, and H2O emission and CH absorption were monitored during the reaction. Using a proposed 15 step reaction mechanism, temperature, pressure, and concentration profiles were calculated for the conditions of the experiment. The concentrations of the intermediates increased rapidly during the early stages of the reaction and then maintained a constant value through most of the induction period. Induction time was defined to be the time between the heating of the gas by the reflected shock wave and the rapid increase in pressure or characteristic emission or absorption. Carbon monoxide and H2O showed a rapid increase early in the induction period and then increased linearly to their equilibrium concentrations. Carbon dioxide increased linearly from the start and only at the end of the induction period did it increase rapidly. A peaking of CH emission was observed; however, OH emission and OH absorption were found to increase simultaneously during the reaction. From the pressure and OH emission, it was concluded that the reaction passes through two phases - a first phase in which the pressure and OH emission increase slowly, followed by a second phase in which the pressure and OH emission increase rapidly.

13936

Davtyan, O. K. and Ye. N. Cvchinnikova

CHEMISORPTION AND OXIDATION OF SULFUR DIOXIDE ON SOLID CATALYSTS AT NORMAL TEMPERATURE. (O khemisorbtsii i okislenii sernistogo angidrida na tverdykh katalizatorakh pri normal'noy temperature). Text in Russian. Doklady Akad: Nauk SSSR, 104(6):857-860, 1955.

An attempt was made to explain the catalytic oxidation of sulfur dioxide on the basis of a theory proposed by O. K. Davtyan. The following catalysts were studied: spongy platinum applied to porous phosphorus through reduction from a solution of chloroplatinic acid, activated charcoal, vanadium pentoxide obtained by coagulation of a colloidal solution in the form of a powder (without carrier), powdered graphite, powdered chromium trioxide, and powdered ferric oxide (listed in order of decreasing activity). In all cases, chemisorption was found to proceed with sufficiently high rate at room temperature, the oxidation products being readily removed as sulfuric acid by washing with water. Curves of total adsorption and chemisorption rates as a function of time were plotted. It is noted that the presence of water vapor on the catalyst surface usually increases the maximum quantity of oxidized sulfur dioxide.

13939

Davtyan, O. K., B. A. Manakin, E. L. Misyuk, and Yu. N. Polishchuk

INVESTIGATION OF THE MECHANISM OF HETEROGENEOUS OXIDATION, HYDROGENATION AND ELECTROCHEMICAL COMBUSTION ON SOLID CATALYSTS. III. RELATION BETWEEN THE DEPOLARIZING OXIDES ON CARBON AND PLATINUM AND THE CATALYTIC EFFECT OF THE LATTER IN THE OXIDATION

CF SO2. (Issledovaniye mekhanizma protessov okisleniya, gidrirovaniya i elektrokhimicheskogo goreniya na tverdykh katalizatorakh. III. Svyaz' mezhdu depolyarizuyushchimi okislami na ugle i platine s kataliticheskim deystviyem poslednikh v reaktsii okisleniya SO2). Text in Russian. Zh. Fiz. Khim., 35(4):1186-1191, 1961. 4 refs.

The chemisorption of oxygen ontc platinum and activated carbon was studied for the case of catalytic oxidation of SO2 using a new electrochemical method in combination with chemical methods. It was established that oxygen being chemisorbed on the surface at 20-100 C participates in forming the potential of the oxygen electrode. The same chemisorption of oxygen takes place with electrochemical oxidation. Oxygen chemisorbed on carbon or platinum at these temperatures is shown to participate in catalytic oxidation of SO2. During this reaction, all oxygen capable of participating in the electrochemical process completely leaves the catalyst surface. It was found that platinum catalyst becomes poisoned in an atmosphere of SO2 at 20 C, rendering it incapable of oxygen chemisorption.

13943

Paduchev, V. V., V. V. Toporova, and N. P. Diyev

INVESTIGATION OF THE REACTION OF LEAD SULFIDE WITH SULFUR DIOXIDE. (Issledovaniye vzaimodeystviya sul'fida svintsa s sernistym angidridom). Text in Russian. Zh. Prikl. Khim., vol. 34: 676-679, Jan.-April 1961. 6 refs.

Sulfur 35 isotope was used to study the reaction of lead sulfide with sulfur dioxide at 650 and 700 C. Data obtained contradict the so-called "sulfate theory" of sulfide oxidation which proposes that under conditions of sulfating calcination, first the sulfur of the sulfides themselves is oxidized to anions SO3(2-) and SO4(2-) and that the metal oxides formed during calcination are only products of subsequent dissociation of the initially obtained sulfates. It now seems more likely that the sulfates formed do not retain sulfur of the original sulfides but acquire it later from the gas phase, i.e., the metal oxides appear ahead of the sulfates: 4MeS* plus 2SO2 yields 4MeO plus 2S*2 plus S2; 4MeO plus 4SO2 yields 4MeSO3; 4MeSO3 yields 3MeSO4 plus MeS.

13948

Foerster, F., T. Burchardt, and E. Fricke

PRODUCTION OF CONCENTRATED NITRIC ACID FROM NITROUS GASES. PARTS A AND B. (Ueber die Gewinnung konzentrierter Salpetersaeure aus nitrosen Gasen). Text in German. Z. Angew. Chem. (Weinheim), vol. 1:113-117, May 11, 1920. PARTS C, D, AND E. Ibid., p. 129-132, May 25, 1920. 10 refs.

A detailed description and discussion is presented of two series of experiments on the formation of nitric acid from nitrous

gases. In the first series, a mixture of gaseous nitrogen dioxide and oxygen was passed through a bell-type wash tower filled with a nitric acid solution. In the second series, oxygen was passed through a mixture of nitric acid and liquid nitrogen dioxide or else known amounts of oxygen and that mixture were thoroughly shaken together. Conclusions are as follows: 1. The notion derived from previous experiments that the process of nitric acid formation from gaseous NO2, O2, and water cannot proceed beyond the nitric acid solution with the lowest vapor pressure, is erroneous. 2. The rate of this process in the range of concentrations of nitric acid at the lowest vapor pressure is so low that an enrichment of nitric acid beyond this range requires a rather long reaction time. 3. For such an enrichment, the smallest possible excess of oxygen and a low rate of flow of the mixture are preferable. 4. With sufficiently long test durations and with progressively decreasing utilization of the NO2, even under the most favorable test conditions, nitric acid concentration rarely goes above 80%. 5. The reason for this is that when a steaming gas mixture is used, the conditions favoring a good utilization of NO2, namely, a small oxygen excess and low rate of flow, are highly unfavorable for the thorough mixing of the reaction solution with oxygen which is also required. 6. However, one can easily attain even the highest nitric acid concentrations if one mixes less concentrated solutions of it with an appropriate amount of liquid NO2 and shakes this mixture thoroughly with oxygen. 7. The process proceeds especially rapidly when the excess of liquid NO2 is so great that, due to its limited solubility in nitric acid, the liquid mixture is heterogeneous and remains so during the reaction. 8. When nitrous gases act on water, from the equilibrium 2NO2 yields N2O4, the latter is dissolved in water and yields the primary reaction N2O4 plus H2O yields HNO3 plus HNO2. 9. The dissociation of the nitrous acid into nitric acid, nitric oxide, and water (3HNO2 yields HNO3 plus 2NO plus H2O), and the rapid oxidation of the latter, effects the transformation of the nitrous gases into nitric acid up to its highest concentrations.

13968

Bodenstein, M.

RATE OF THE REACTION BETWEEN NITRIC OXIDE AND OXYGEN. (Die Geschwindigkeit der Reaktion zwischen Stickoxyd und Sauerstoff). Text in German. Z. Elekrcchem., 24(13-14):183-201, July 1, 1918. 26 refs.

A very detailed description is presented of an extensive series of experiments on the reaction of NC with 02 that were carried out to resolve a controversy between Lunge and Berl and Raschig. Both gases were mixed at very low pressures and the reaction was followed by observing the pressure drop, with a correction being made for the formation of N2O4. It took place strictly in accordance with the third-order equation and its rate was found to decrease quite noticeably with increasing temperature in the interval between 0 and 90 C. Furthermore, this reaction was found tc be independent of additons of NO2, water vapor, and SO2. The

oxidation of SO2 at the temperature used (60 C) was not catalyzed by the nitrogen oxides. The results of experiments of Lunge and Berl, evaluated in an analopous manner, were in excellent agreement with those of the author, while those of Raschig were but moderately so at conversions of more than 50%. In the light of the present knowledge of the solution process of the higher nitrogen oxides, Raschig"s hypothesis regarding the role of N2O3 in the process of oxidation of NO to NO2 is no longer tenable.

14055

Kurin, N. P. and I. O. Blokh

CATALYTIC OXIDATION OF NITRIC OXIDE. PART I. (Kataliticheskoye okisleniye okisi azota. Soobshcheniye I). Text in Russian. Zh. Prikl. Khim., 11(5):734-749, 1938. 10 refs.

Experimental study of three materials is reported: silica gel, vanadium catalyst used in the contact method of nitric acid production, and chromium-zinc catalyst used in methanol synthesis. These catalysts were used to oxidize NO to NO2 with a volumetric flow rate of 200-600 per hour at 25-200 C. The incoming gas was dried over concentrated sulfuric acid and had the following composition (vol %): NO, 3.0; O2, 7.8; atmospheric nitrogen, balance. Catalytic action occurred in all cases, total degree of oxidation decreasing with increased flow rate. As the temperature increases above 200 C, reaction rate decreased (greatest decrease with silica gel). Silica gel was found to be the best catalyst for temperatures up to 100 C. In the 150-200 C range, silica gel and vanadium catalyst were comparable, both being more active than the chromium-zinc catalyst. Rate equations are given. The apparent energies of activation for these catalysts are 4700, 1850 and 340 cal/role.

14056

Nesterenko, V. P. and B. Ye. Tverkovkin

REACTION EQUATIONS FOR THE REVERSIBLE SYSTEM N2O4 YIELDS 2NO2 YIELDS 2NO PLUS O2 IN A FLOW. (Uravneniya kinetiki khimicheskikh reaktsiy sistemy N2O4 yields 2NO2 yields 2NO plus O2 v potoke). Text in Russian. Vestsi Akad. Nauk Belarusk. SSR: Ser. Fiz. Tekhn. Navuk, no. 1:34-43, 1966. 13 refs.

A mathematical description of the reaction kinetics for the reversible system involving nitrogen tetroxide, nitrogen dioxide, nitric oxide, and oxygen in a flow is presented. A mathematical model of heat and mass transport in the presence of chemical reaction is described in general using the differential equations of mass, momentum, and energy conservation. Good agreement with experimental data from the literature is found. The proposed method may be applied to the question of heat flow in cases both with heating and with cooling, and also to more complex chemical reaction schemes. The question of heat exchange within the chemically reacting mixture is not treated.

oxidation of SO2 at the temperature used (60 C) was not catalyzed by the nitrogen oxides. The results of experiments of Lunge and Berl, evaluated in an analopous manner, were in excellent agreement with those of the author, while those of Raschig were but moderately so at conversions of more than 50%. In the light of the present knowledge of the solution process of the higher nitrogen oxides, Raschig's hypothesis regarding the role of N2O3 in the process of oxidation of NO to NO2 is no longer tenable.

14055

Kurin, N. P. and I. O. Blokh

CATALYTIC OXIDATION OF NITRIC OXIDE. PART I. (Kataliticheskoye okisleniye okisi azota. Soobshcheniye I). Text in Russian. Zh. Prikl. Khim., 11(5):734-749, 1938. 10 refs.

Experimental study of three materials is reported: silica gel, vanadium catalyst used in the contact method of nitric acid production, and chromium-zinc catalyst used in methanol synthesis. These catalysts were used to oxidize NO to NO2 with a volumetric flow rate of 200-600 per hour at 25-200 C. The incoming gas was dried over concentrated sulfuric acid and had the following composition (vol %): NO, 3.0; O2, 7.8; atmospheric nitrogen, balance. Catalytic action occurred in all cases, total degree of oxidation decreasing with increased flow rate. As the temperature increases above 200 C, reaction rate decreased (greatest decrease with silica gel). Silica gel was found to be the best catalyst for temperatures up to 100 C. In the 150-200 C range, silica gel and vanadium catalyst were comparable, both being more active than the chromium-zinc catalyst. Rate equations are given. The apparent energies of activation for these catalysts are 4700, 1860 and 340 cal/mole.

14056

Nesterenko, V. P. and B. Ye. Tverkovkin

REACTION EQUATIONS FOR THE REVERSIBLE SYSTEM N2O4 YIELDS 2NO2 YIELDS 2NO PLUS O2 IN A FLOW. (Uravneniya kinetiki khimicheskikh reaktsiy sistemy N2O4 yields 2NO2 yields 2NO plus O2 v potoke). Text in Russian. Vestsi Akad. Nauk Belarusk. SSR: Ser. Fiz. Tekhn. Navuk, no. 1:34-43, 1966. 13 refs.

A mathematical description of the reaction kinetics for the reversible system involving nitrogen tetroxide, nitrogen dioxide, nitric oxide, and oxygen in a flow is presented. A mathematical model of heat and mass transport in the presence of chemical reaction is described in general using the differential equations of mass, momentum, and energy conservation. Good agreement with experimental data from the literature is found. The proposed method may be applied to the question of heat flow in cases both with heating and with cooling, and also to more complex chemical reaction schemes. The question of heat exchange within the chemically reacting mixture is not treated.

14081

Kleinerman, Jerome and C. Richard Cowdrey

THE EFFECTS OF CONTINUOUS HIGH LEVEL NITROGEN DIOXIDE ON HAMSTERS. Yale J. Biol. Med., 40(5-6):579-590, April-June 1968. 11 refs.

In an attempt to experimentally produce emphysema lesions by exposure to nitrogen dioxide, the experimental design of earlier studies was altered so that the previously untested Syrian hamster species could be continuously exposed (20 to 22 hrs/day) for a prolonged period to concentrations of NO2 sufficiently high to produce a moderate mortality (45-55 ppm). Experimental findings are presented. While the size of the alveolar spaces appeared enlarged in the exposed animals compared to the controls, there was no evidence of destruction of alveolar septal tissue, leading to the conclusion that a tissue-destructive form of emphysema was not produced in this experiment. The use of continuous exposures for prolonged periods, even at concentrations that produce a mortality of approximately 35%, does not appear to alter the nondestructive character of the tissue response. The hamster thus joins the other rodent groups previously studied, by these authors as species that respond characteristically to NO2 inhalation by an exudative and proliferative reaction without evidence of tissue destruction. The character and degree of the epithelial and inflammatory response appear similar in kind and proportional in extent to the time concentration product imposed. The variability in the response among bronchioles in a single lung is seen as even more disquieting than the differences in degree of reaction among animals similarly exposed, suggesting that profound differences in the uniformity of distribution of the inhaled noxious agent exist. These observations are consistent with physiological observation, but their fundamental basis remains unclear. The rapid and almost complete involution of the epithelial hyperplastic and inflammatory response produced by NO2 in the animals studied 30 days after cessation of exposures is considered remarkable and is thought to demonstrate the extensive reparative properties of the lung. The return toward normal of the lung volumes and right ventricular weights in this group again suggests that a reversible lesion is being repaired and lends support to the conclusion that no permanent tissue destruction has been produced by these profound experimental exposures. Two factors are discussed as possible causes of apparent differences between these results and those of other investigators carrying out similar experiments: the use of varying definitions of the term emphysema and varying techniques to inflate and fix lung tissue. A record of a discussion of this paper is included.

14092

James, David W.

THE RATE OF OXIDATION OF NITRITE IONS IN DILUTE SOLUTIONS OF SODIUM NITRITE IN MOLTEN LITHIUM PERCHLORATE. J. Phys. Chem., 72(3):876-879, March 1968. 12 refs.

Quantitative data on a slow reaction between oxo anions in an ionic melt were obtained by adding small amounts of NO2(-) in the form of NaNO2 to molten LiClO4 and simultaneously oxidizing the NO2(-) anions to NO3 and reducing the solvent ClO4(-) anions to Cl(-) at 245-301 deg. The reaction isotherm was measured spectrophotometrically by determining the change with time of the absorption intensity of the NO2(-) and NO3(-) bands. Results show that the simultaneous oxidation and reduction is a pseudo first-order homogeneous reaction. The first-order rate constant is 0.000351/sec at 274 deg, and the activation energy is 31.5 kcal/mol. There is no buildup of per chlorate ions during the course of the reaction. The reaction is unaffected by gaseous nitrogen or substantial additions of water, LiOH (5 mol%), LiNO2 (10 mol%), or gaseous oxygen. The evidence suggests the possibility that the rate-determining step involves a direct oxygen transfer between a nitrite and a perchlorate ion. (Author abstract modified)

14100

Wyatt, P. A. H.

METHODS FOR CALCULATING THE EXTENT OF DISSOCIATION OF COMPOUNDS IN THE LIQUID STATE. Trans. Faraday Soc., vol. 52:806-815, Jan.-June 1956. 21 refs.

A straightforward application of Raoult's law to the dissociation of a compound in the liquid state shows that explicit values of the extent of dissociation (alpha) can be calculated from experimental estimates of the first and second differential coefficients or the corresponding vapor-pressure derivatives. When the form of dissociation is uncertain, the quantity alpha(a plus b)/abs can be determined, in which a and b are the numbers of particles produced in solution per molecule of the two primary dissociation products, and s is the number of molecules of the compound involved in the dissociation equation. For compounds of small dissociation, a and b can be evaluated by a combination of freezing-point and partial molar heat content data, thus supplementing the methods already in use. For compounds of large dissociation, cryoscopic data can be used to test whether or not dissociation is complete. (Author abstract modified)

14104

Detry, D., J. Drowart, P. Goldfinger, H. Keller, and H. Rickert

STUDY OF THE THERMODYNAMICS OF SULFUR VAPOR. MASS SPECTROMETRIC STUDIES WITH THE ELECTROCHEMICAL KNUDSEN CELL. (Zur Thermodynamik von Schwefeldampf. Massenspektrometrische Untersuchungen mit der elektrochemischen Knudsen-Zelle). Text in German. Z. Physik. Chem., 55(5/6):314-319, Aug. 1967. 13 refs.

Theoretical and experimental studies show that sulfur vapor

contains not only S2, S4, S6, and S8 molecules, but also S3, S5, and S7 molecules. An attempt was made to obtain exact thermodynamic data for all types of vapor molecules with the aid of an electrochemical Knudsen cell combined with a mass spectrometer. The Knudsen cell was directly arranged in the spectrometer instead of the ion source. Sulfur from solid silver sulfide was evaporated in the Knudsen cell according to the series Pt,Ag/AgJ/Ag2S,Pt. The electric current, J, with the positive pole of an outside source applied on the right side of the series permitted variation of the discharge velocity of the sulfur from the cell and thus of the pressure of the sulfur vapor. For each stationary state, adjusted by electric current J, three variables were obtained, namely the electric current, the electromotive force, and the concentrations of the various types of S molecules after separation in the mass spectrometer. The concentration may be either that of primary molecules in the Knudsen cell or that which develops by fractionation of larger molecules by ionization. They are separately determined. With these variables and the sensitivity of the mass spectrometer, the partial pressures can be computed. Extrapolation of the straight line indicating the partial pressures to the saturation point yields the saturation partial pressures, which by addition, lead to the total pressure. The measurements were performed within a temperature range of 200 to 400 C. Enthalpies and entropies for the various molecules were computed.

14146

McCaa, David J. and Dietmar E. Rothe

EMISSION SPECTRA OF ATMOSPHERIC GASES EXCITED BY AN ELECTRON BEAM. AIAA (Am. Inst. Aeron. Astronaut.) J., 7(8):1648-1651, Aug. 1969. 6 refs.

The molecular gases NO, O2, H2O, CO, and CO2 were excited by electron beam techniques to study their interaction with the N2(plus)(1-) spectrum from 2800 to 6600 A and at 10 to 100 micron pressures. The intensity of the nitrogen fluorescence spectrum exceeds that of any other system observed. Spectra of N2, O2, CO, and CO2 are composed of molecular ion bands with some atomic lines present, while the spectra of NO, H2, and H2O consist primarily of atomic lines. Atomic lines follow a linear intensity dependence with pressure. The molecular ion bands, with the exception of N2(plus) exhibit quenching at higher pressures, the pressure at which quenching becomes significant varying among gases. Relatively strong self-quenching was observed for the first negative system of O2(plus), for the comet tail system of CO(plus), and for the Fox, Duffendack, and Barker system of CO2(plus). Characteristic self-quenching pressures for these systems appear to be 50, 20, and 150 microns Hg, respectively. Strong relative enhancement of neutral CO bands by secondary electrons was found at higher pressures. At gas pressures below 100 microns, the intensity of the N2(plus)(1-) system is not severely affected by the presence of O2, H2, H2O, or CO. (Author conclusions modified)

14155

Hamill, William H.

ION-MOLECULE REACTIONS. J. Chem. Educ., 36(7):346-349, July 1959. 17 refs.

The study of the reactions between gaseous ions and molecules, a fundamental problem in radiation chemistry, is reviewed. Early work on the problem and current theoretical considerations are summarized, and experimental aspects are described in terms of the use of the mass spectrometer, the source of most current information concerning ion-molecule reactions. Thermochemical methods of testing mass spectrometric appearance potentials are discussed, and a thermochemical cycle is presented based on the principle that ion-molecule reactions, to be observed in a mass spectrometer, must have zero activation energy. In a discussion of criteria, measured reaction cross sections at ion energies of about 1 ev are placed in the range 50-200 times 10 to the minus 16 sq cm and are described as independent of temperature. Recent work is reviewed and found to demonstrate qualitatively the decreasing cross section with increasing ion velocity. The limitations of mass spectrometry in the development of radiation chemistry are considered.

14179

Iyengar, R. D. and V. V. Subba Rao

ELECTRON SPIN RESONANCE OF NITROGEN DIOXIDE (NO_2) ADSORBED ON ZINC OXIDE. J. Am. Chem. Soc., 90(12):3267-3269, June 5, 1968. 10 refs.

The electron spin resonance (esr) spectra of NO_2 adsorbed on zinc oxide was investigated. Tests was made on high-purity zinc oxide samples with surface areas of 3 square meters per gram. Before the treatment with ultrahigh-purity NO_2, samples were outgassed for 2 hours at 500 C 0.000001 torr. The resulting esr spectra were reprinted and discussed. The outgassing procedure and thermodynamics were varied, and subsequent signal changes were analyzed. Chlorine treatment of the sample was seen to produce a sharp signal at g equal 2.015, indicating that the same peak previously noted was not due to chemisorbed oxygen atoms, the previous notion. Investigations to this point suggest the presence of shallow levels on ZnO which give rise to the signal after the loss of an electron to the interacting gas at the surface.

14188

Roth, W. A., P. Grau, and A. Meichsner

CONTRIBUTIONS TO THE THERMOCHEMISTRY OF SULFUR. III. (Beitraege zur Thermochemie des Schwefels. III.) Text in German. Z. Anorg. Allgem. Chem., vol. 193:161-175, 1930. 13 refs.

Gaseous SO2 was oxidized with dilute hydrogen peroxide solutions in a calorimeter at 20 C to dilute sulfuric acid. The heat developing upon decomposition and dilution of H2O2 was measured at various concentrations. The results showed good agreement with values obtained in recent American studies. The heats developing upon dilution were remarkably small. For the heat developing upon oxidation of SO2, a value higher than that obtained by Thomsen was found. By using the enthalpies of SO2, the enthalpies of liquid SO3, H2SO4, and 5000 parts H2O were computed. Comparison with older thermochemical data led to the conclusion that the values for the heat of dilution are too high. From solubility data, new lower values were derived which show the high increase with increasing dilution demanded by the theoretical finding. Efforts to burn sulfur in a steel container to a mixture of SO2 and SO3 and to derive the enthalpies of both oxides failed because the SO2 became oxidized. If side reactions are avoided, many heats of oxidation can be determined with dilute H2O2 solution. If sulfur dioxide heat of solution is accurately determined, reduction heats of SO2 solutions in inert atmospheres can be measured.

14219

Oza, Trambaklal Mohanlal and Vasantrai Trambaklal Oza

THE ACTION OF DINITROGEN TETROXIDE ON HYPONITRITES, NITRITES AND OXIDES. THE INDUCED DECOMPOSITION OF HYPONITRITES. J. Am. Chem. Soc., 78(15):3564-3567, Aug. 1956. 15 refs.

To elucidate the effect of nitrogen dioxide on oxides, nitrates, and hyponitrites, all of which are present in the thermal decomposition of hyponitrites, N2O4 and NO2 were reacted with Ag2N2O2, SrN2O2-5H2O, and SrN2O2; with AgNO2, Ca(NO2)2-H2O, and Ca(NO2)2-1/4H2O; and with Ag2O and CaO. Both solid and gaseous products of the reactions were quantitatively analyzed. Results show that (1) the nitrogen of the hyponitrite molecule does not remain intact; (2) water exercises a profound influence on the reactivity of the nitrites, hydrated nitrite reacting even at 0 deg and anhydrous silver nitrite reacting only at 120 deg; (3) nitrate is the primary product of the reaction of N2O4 or NO2 with CaO, but both nitrate and nitrite are produced by the reaction with Ag2O; and (4) formation of nitrous oxide and nitrogen from the action of dinitrogen tetroxide on hyponitrites does not take place directly from N2O4 but originates from the hyponitrites. The thermal decomposition of the hyponitrites is shown to occur in the sequence M2N2O2 yields M2O plus N2O and (2) 3M2N2O2 yields 2M2O plus 2MNO2 plus 2N2. Lack of appearance of oxide in the products and appearance of nitrate can be ascribed to secondary reactions of the oxide and nitrite formed with N2O4 and NO2.

14224

Sawatani, Tsugio and Tsugikatsu Odajima

NATURAL OXIDATION OF DILUTE SULFUR DIOXIDE. Translated from Japanese. Tohoku Univ. (Japan), 1 p., 1968. (Presented at

the 21st Annual Meeting of the Japanese Chemical Society, Japan, 1968.)

The velocity of the oxidation of dilute SO2 gas in the atmosphere was studied. SO2 gas was generated using the method whereby air is blown through a given concentration of sodium sulfite with a predetermined pH. The gas was tested at atmospheric pressure. The reaction increased in velocity with an increase in temperature and when irradiated with a fluorescent lamp.

14232

Rice, O. K.

A KINETIC APPROACH TO THE THERMODYNAMICS OF IRREVERSIBLE PROCESSES. J. Phys. Chem., 61(5):622-629, May 1957. 20 refs.

The study of flows of heat and matter which occur under gradients of temperature and concentration is considered in terms of a transfer process involving the exchange of molecules from both solvent and solute, with transfer of solute in one direction accompanied by transfer of solvent in the other. This process takes place within the transfer units whose interaction with the rest of the solution is 'average' and does not change when the transfer occurs. A transfer unit which is the same as the original unit except that the reverse process can occur in the inverse unit. Differences between the concentrations of direct and indirect units result from the tendency of a transfer unit to come into equilibrium with a specific component of the solution at the point in the gradient where this component actually occurs in the transfer unit. From the hypothesis that transfer units have definite temperatures and concentration gradients, equations were determined for calculating fluxes and heat of matter. The kinetic formulation is shown to support reciprocal relations between phenomenological coefficients and to give automatically the laws of irreversible thermodynamics. Equations are also derived for the Soret effect and for systems with charged particles; they are discussed from the point of view of heats of transfer of OH(minus) and H(plus). The extension of the transfer unit theory to heterogeneous systems, where the temperature gradient occurs in the membrane, is considered and illustrated by application to the Knudsen flow of gas through a porous plug.

14285

Pannetier, Guy

EXPERIMENTAL RESEARCH ON THE COMBUSTION MECHANISM IN THE GASEOUS PHASE. (Recherches experimentales sur le mecanisme des combustions en phase gazeuse). Text in French. Rev. Inst. Franc. Petrole Ann. Combust. Liquides (Paris), 4(5):166-179, May 1949.

Various attempts are made to explain the production of free radicals in active combustion. Constants of the ClO radical are given. Proof of the origin of these radicals resulted from the study of cyanogen, which enabled an explanation to be made for the mechanism of combustion and the influence of various factors. Various inflammability limits are also discussed in light of the mechanism. Reactions between free radicals explained differences between inflammability limits of dry and wet cyanogen. The cause of the results with methyl oxide and acetylene could not be explained. Inflammability limits could not be considered as specific chemical individuality constants. The study concluded that even propagation speeds of combustion of a given compound vary when the inner surface of the vessel in which it propagates is altered. (Author abstract modified)

14293

Peatman, W. B., T. B. Borne, and E. W. Schlag

PHOTOIONIZATION RESONANCE SPECTRA. I. NITRIC OXIDE AND BENZENE. Chem. Phys. Letters (Amsterdam), 3(7):492-497, July 1969. 21 refs.

A new method is described for the study of ionized molecules by direct observation of optical resonance in photoionization. This method interposes an electron filter in the system so that a signal is detected in the measuring circuit only at the point where the optical monochromator sweeps through a resonance transition. Photoionization is carried out at the intersection of a well-focused beam of light and a high intensity molecular beam at right angles to the photon beam. Electrons are withdrawn perpendicular to both of these beams. The energy of the photoionization resonance is directly read off the setting of the optical monochromator. Contributions from lower photoionization processes are avoided. Photoionization resonance scans of benzene show the presence of two peaks at 10.385 and 10.471 eV, respectively. It is thought that these peaks are due to a new electronic level of C6H6(plus) at 10.385 eV and that this level corresponds to the removal of a sigma electron from the benzene molecule. Data obtained for NO(plus) using this method were compared with data previously obtained by other methods. The average ionization potential of five experimental runs was in exact agreement with the spectroscopic value of other investigations.

14317

Warneck, Peter

PHOTODETACHMENT OF NO2(-). Chem. Phys. Letters (Amsterdam), 3(7):532-533, July 1969. 10 refs.

The photodetachment of electrons from NO2(-) ions by light in the violet portion of the visible spectrum was observed. Negative

ions were extracted from a discharge source, accelerated to a speed of about 6,000,000 cm/sec, collimated, and mass separated in a 90 degree, stigmatically focusing magnetic analyzer. After passing the photodetachment chamber, the ions were trapped and discharged in a Faraday cup. Photoelectrons were withdrawn at right angles by a weak electric field and were detected with a venetian blind electron multiplier. The signal was processed by a phase sensitive amplification and was displayed on a strip chart recorder. The apparent photodetachment threshold is approximately 4740 A, which corresponds to an energy of 2.74 eV. The derived threshold energy provides only a lower limit to the vertical detachment energy because a portion of the NO2(-) ions are vibrationally excited. Subsequent to the formation of a negative ion in the discharge, the ion drifts toward the anode, picking up energy in the electric field and losing energy by collisions. This mechanism leads to a quasi-Boltzmann vibrational energy distribution among the ions equivalent to an estimated temperature of several thousand degrees. The excess vibrational energy cannot be dispersed because the radiative lifetime of the involved states is about one hundred times greater than the transit time of the ions in the apparatus. A semi-logarithmic plot of photoionization cross sections versus energy of ground state molecules, as compared to that of vibrationally excited ones, often indicates the beginning photoionization by a break in the cross section curve. A break occurred at 3.10 eV and was identified as the first ionization potential of NO2(-), so that 3.10 eV is the electron affinity of NO2. These results provided the first direct determination of the electron affinity of NO2.

14331

Soong, An-Liang

THE CHARGE ON LATEX PARTICLES AEROSOLIZED FROM SUSPENSION AND THEIR NEUTRALIZATION IN A TRITIUM DE-IONIZER. Thesis (M.S.), Rochester Univ., Rochester, N. Y., UR-49-1000, 1968, 41p. 12 refs.

One of the most common methods of producing exposure aerosols in the laboratory is by the atomization of a solution or suspension of toxic materials; droplets produced in this way are usually charged. Such suspensions are involved in laboratory experiments to establish maximum permissible concentrations in air for various toxic materials; to have validity, these laboratory exposure aerosols should resemble as closely as possible conditions in industrial environments. Investigations were carried out to measure the charge distribution on insoluble particles produced by atomization of a suspension and to determine the degree to which the charges are neutralized by passage through a tritium deionizer. Detailed description and data of the experimental methods and apparatus are presented, including a description of the charge spectrometer and tritium deionizer, and the theory of particle collection by the instrument. It is concluded that airborne particles produced by atomization of a suspension in distilled water carry a wide range of electrical charges. While some particles are neutral, others carry as many as 1384 electrical charges. The charge distribution of the particles

14380

Ganz, S. N.

KINETICS OF ABSORPTION OF NITROGEN OXIDES BY SULFURIC ACID IN ROTARY ABSORBERS WITH A LARGE NUMBER OF REVOLUTIONS. (Kinetika absorbtsii okislov azota sernoy kislotoy v rotatsionnykh absorberakh s bol'shim chislom oborotov). Text in Russian. Zh. Prikl. Khim., 29(7):1018-1028, 1956. 5 refs.

Absorption of nitrogen oxides with 76 and 92% sulfuric acid in a high-rpm horizontal absorber was studied experimentally. The test absorber, designed to take advantage of bubbling, spray, and film absorption, is described in detail. The effectiveness of such absorbers for use in sulfuric acid production was demonstrated. Experimental data is used to determine rate coefficients for nitrogen oxide absorption as functions of disk rotation rate, volumetric gas flow rate, concentration of nitrogen oxides in the gas, sulfuric acid concentration, and temperature. These coefficients may be used for mechanical absorber design. It was established that with a highly turbulent regime, the absorption rate for an equimolar mixture of NO and NO2 exceeds the rate for NO2 alone but to a lesser degree than under conditions of film absorption.

14384

Ioshpa, I. Ye.

KINETICS OF NITROGEN DIOXIDE ABSORPTION BY A SULFUR-NITROGEN MIXTURE. (Kinetika protsessa absorbtsii dvuokisi azota serno-azotnoy smes'yu). Text in Russian. Dokl. Vses. Nauch. Konf. Rab. Kafedr Tekhnol. Neorg. Veshchestv, Nauch. Uchrezhd. Proekt. Organ., 4th, Tashkent, 1964, p. 74-81.

If a sulfur-nitrogen mixture is saturated with a gas containing 32% NO2 at 30 C, it is possible to obtain a solution containing 14-15% N2O3 and 10-11% HNO3. It was found experimentally that at 30C, the absorption rate coefficient can be raised from 1.32 to 7.75 g/sq m-hr-mm Hg by irrigating the column packing with a solution of the following composition: 7.78% N2O3, 0.3788% HNO3, 87.24% H2SO4, and 4.57% H2O. An experimental curve was plotted which allows determination of the height of the packing and the mass-exchange surface area needed to achieve NO2 removal to near equilibrium concentration. Curves are also given for determining the required packing surface area for saturation of a sulfur-nitrogen solution with NO2 to the appropriate concentration with respect to N2O3 and HNO3. The coefficient of absorption rate as a function of packing height was plotted and can be used to differentially calculate the required packing surface area under industrial conditions in series-connected towers. A correction factor is derived which relates the coefficient of absorption rate for the ring-shaped test packing to that of 25 times 25 times 3 mm industrial packing. This was done by examining the kinetics of absorption of ammonia by water on the same installation under the same hydrodynamic regime.

was not symmetrical with respect to polarity. The tritium source discharges most particles which have a large number of charges and significantly reduces the average charge. (Author summary modified)

14385

Stezhenskiy, A. I., V. S. Luk"yanchikov, and V. B. Protsenko

OXIDATION OF NITROGEN DURING COMBUSTION OF METHANE-NITROGEN-OXYGEN MIXTURES. (Okisleniye azota pri gorenii metano-azoto-kislorodnykh smesey). Text in Russian. Khim. Prom. Ukr. (Ukr. Ed.), no. 1:7-9, 1967. 2 refs.

A methane-nitrogen-oxygen mixture was burned at a rate of 50 cu m/hr. Enriched air with an oxygen content of 40 to 73% was provided in an excess of 1.3 to 2.6. Inlet temperature ranged from 300 to 600 C and maximum NO yield (1.82%) was obtained with an oxygen content of 70% and an air excess of 1.7 (equivalent to equimolar nitrogen-oxygen ratio in combustion products). It is concluded that such a continuously operating arrangement for fixing atmospheric nitrogen has a number of advantages: constant NO concentration, ease of process control and possibility of automatic control, low thermal cycling assures prolonged and reliable operation of refractory materials made of MgO or ZrO2. The combustion chamber used was described in an earlier article.

14418

Szargan, Peter

ON THE OXIDATION KINETICS OF SOOT. (Zur Kinetik der Oxydation von Russ). Text in German. Chem. Techn. (Berlin), 21(8): 460-461, Aug. 1969. 5 refs.

A kinetic equation for the oxidation of soot by CO2 and steam was derived and solved. The specific surface of the soot was found to be 173 sq m/g, the activation energy 59 kcal/mole. The specific surface measured by adsorption of nitrogen and iodine was found to be 485 sq m/g. Apparently, only a fraction of the surface is accessible to oxidation. Experimental results obtained in several plants for gasification of liquid hydrocarbons with steam and oxygen agree well with the theoretical calculations. They show that during gasification, a constant amount of soot is formed which is variously oxidized, depending on reaction conditions.

14450

Hollax, E., K. Schwabe and K. Wiesener

ELECTROCHEMICAL CLEANING OF INDUSTRIAL WASTE GASES AND DEVELOPMENT OF A NEW TWO LAYER ELECTRODE. (Uber die Beseitigung von Industrieabgasen auf elektrochemischem Wege und die Entwicklung

einer neuartigen Zweischichtelektrode.) Text in German. Dechema Monograph, 59(1045-1069):147-157, 1968. 14 refs.

Elimination of gaseous pollutants from industrial waste gases poses many problems, particularly the removal of SO2. In an effort to find a satisfactory solution, electrochemical fuel cell experiments were conducted with SO2 diluted with inert gas to obtain a realistic concentration. Results of galvanostatic tests showed that 90% of the SO2 could be removed from the waste gas feed to the anode. Measurement of the potentials against a Hg/hg2SO4 reference electrode in 3.8 n H2SO4 showed that at a fuel dilution of 1:1000 there are theoretical limits with respect to the attainable current density and the cell voltage. Further experiments were concerned with removal of other substances in the waste gas in electrochemical fuel cells. Since oxygen electrodes are 'blubber' electrodes, no difference between pure oxygen and air as reactant was found at the cathode. With methane and carbon monoxide only, considerably lower current densities could be achieved. For conversion of reaction gases, it is advisable to use tightly-sealed, non-gassing electrodes with high electrochemical activity. These demands are fulfilled by a carbon electrode consisting of a hydrophobic substrate and a less hydrophobic coating. The coating layer is produced by surface decomposition of the binding and hydrophobilizing agent of a hydrophobic carbon body in the presence of a catalyst such as Ag, Pt, etc. Its use as an oxygen electrode is discussed. The effects of operating parameters such as temperature, gas pressure, oxygen partial pressure and KOH concentration on electrochemical power generation and on long-term performance are discussed.

14471

Schischkov, D., M. Kojcharova, D. Iwanov, Z. Galunski, G. Dimov, K. Gruev, and D. Grueva

A STUDY OF THE CONVERSION OF CARBON MONOXIDE AND THE SIMULTANEOUS REMOVAL OF NITRIC OXIDE AND OXYGEN FROM THE SYNTHESIS GAS WITH LOW-TEMPERATURE CATALYSTS. (Studie ueber die Konvertierung von Kohlenoxid und die gleichzeitige Entfernung von Stickoxid und Sauerstoff aus Synthesegas mit Hilfe von Tieftemperaturkatalysatoren). Text in German. Allgem. Prakt. Chem. (Vienna), 20(3):68-70, 1969. 8 refs.

Low-temperature catalysts developed at the Chemical Technological Institute in Sofia, Bulgaria, were tested with respect to their activity in the conversion of carbon monoxide and hydrogenation of nitric oxide and oxygen. The synthesis gases had an average composition of 88% H2, 3.5% N2 and Ar, 5.4% CO, 2.5% methane, 0.6% CO2, up to 5 mg/cu m H2S, up to 0.5 ppm NO, and up to 1000 ppm O2. Catalytic activity was judged by the residual content of CO, NO, and oxygen in the synthesis gas. The basic constituents of the catalysts are the oxides of zinc, copper, and chromium. The specific surfaces of the non-reduced catalysts were between 30 and 60 sq m/g. To protect the catalysts against sulfur compounds, they were coated with a layer of desulfurized zinc oxide. Reduction of the

catalysts took place at temperatures below 250 C with a gas mixture diluted with nitrogen. The results showed that the same carbon monoxide concentration was obtained with all catalysts. They further showed that the throughput velocity had a considerable influence on the residual CO content, but that this influence becomes weaker at higher temperatures. The catalysts have the capacity to reduce nitric oxide and oxygen, making it feasible to convert carbon monoxide and clean the synthesis gas in one step.

14500

Gottauf, M.

GAS-CHROMATOGRAPHIC DETERMINATION OF ORGANIC COMPOUNDS IN AIR IN PRESENCE OF OZONE. (Gas-chromatographische Bestimmung organischer Verbindungen in Luft bei Anwesenheit von Ozon). Text in German. Anal. Chem., 246(1):31, 1969. 2 refs.

Trace analyses of organic compounds in air can be successfully performed by using a gas chromatographic method. The air sample is passed through a cold trap which causes the organic compounds to condense. The carrier gas then takes them through the chromatographic column. In the presence of ozone, the ozone is also condensed, at least in part, in the cold trap and begins to react with certain organic compounds either immediately or during the heating process. Many organic substances are thus destroyed and cannot be analyzed. This result can be avoided by adding an excess amount of ethylene to remove the ozone. This method was successfully used for measurements of the reaction rate between ozone and various gaseous odorants. It was possible to determine hexanal, 2-hexenal limonenes, allylisothiocyanate, and pyridine in concentrations of 10 to the minus eighth power moles/l at ozone concentrations between 10 to the minus seven and 10 to the minus five moles/l.

14570

Ivanov, V. N.

KINETICS OF NITRIC OXIDE DISSOCIATION STUDIED BY ABSORPTION SPECTROSCOPY. (Izucheniye kinetiki raspada okisi azota metodom absorbtsionnoy spektroskopii). Text in Russian. Izv. Akad. Nauk SSSR, Ser. Fiz., 27(1):35-37, 1963. 5 refs.

Dissociation of NO at concentrations of 0.32 to 1.94 times ten to the 19th power moles/cu cm at 650 C was studied by absorption spectroscopy, the rate of dissociation being determined from the intensity of the NO2 line. In all cases, equilibrium was reached in about 10 hrs. Introduction of 0.5% oxygen caused the dissociation rate to double, the resultant NO2 being the actual catalyzing agent. Comparison is made with contradictory data found in the literature.

14603

Shelef, M.

CATALYTIC REDUCTION OF NITRIC OXIDE. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 87-112. 24 refs.

A method was sought for the selective heterogeneous reduction of nitric oxide in the presence of excess oxygen. The decomposition rate of NO on a series of catalysts was studied in a conventional flow apparatus using NO as such or diluted with He. It was concluded that the decomposition reaction is too slow for practical application. The reduction of NO by CO was studied in the same flow system and used a mass-spectrometric technique. The hypothesis advanced is that the limiting stage of the oxidation mechanism with the participation of NO differs from that with O2. With O2 as the oxidizing agent, the rate-limiting catalyst-oxygen bond scission occurs during the reduction of the catalyst. In the oxidation with the participation of NO, the slow step may be the re-oxidation of an active site involving the accommodation of the nitrogen atom. The formation of the N-N bond is postulated, which for the formation of N2 requires the presence of a pair of NO molecules situated in close proximity. The requirement of the formation of the N-N bond may explain why the re-oxidation step of a surface site by NO could be a low probability event. The accepted view of NO chemisorption is through the nitrogen end of the molecule undergoing a surface rearrangement for the oxidation of a reduced surface site. The appearance of N2O is observed when passing NO on a reduced surface in the absence of CO, which supports the role of the N2O as an intermediate in the overall process. This hypothesis, which assumes the interaction of NO with the reduced surface as being the limiting process, explains the preferential participation of oxygen in the oxidation of CO when competing in this reaction with NO. It also explains the absence of the correlation between the surface-oxygen bond strength and the catalytic activity sequence in the CO-NO reaction, which is Fe2O3, Cu2O, Cr2O3, NiO, Co3O4, MnO, V2O in the order from most active to least active. This is out of th pattern observed in reactions where oxygen is the oxidizing agent.

14620

Briner, E., G. H. Lunge, and A. van der Wijk

RESEARCH ON THE REACTIONS BETWEEN NITROGEN PEROXIDE AND SULFUR DIOXIDE. (Recherches sur les reactions entre le peroxyde d'azote et l'anhydride sulfureux). Text in French. Helv. Chim. Acta, vol. 11:1125-1144, 1928. 15 refs.

Laboratory techniques for studying the reactions of nitrogen

dioxide and sulfur dioxide, both in the liquid and gas phase, are elaborated. In the liquid phase, under 100 atm pressure, the following overall reaction occurs: 3/2 N2O4 plus 2SO2 yields S2N2O9 plus NO. The compcund S2N2O9 behaves like an anhydride of nitrosyl sulfuric acid in its reactions with water, alkali, and SO2. It is stable at ordinary temperatures even in a vacuum. Heat decomposes it into the compounds S2NO7 and NO2; the reaction is slightly reversible. The reaction forming S2N2O9 from liquid sulfur dioxide and liquid dinitrogen tetroxide is very exothermic; its heat of reaction has been evaluated at 112 cal/g-mole. In the gas phase, the reaction between dinitrogen tetroxide and SO2 proceeds somewhat slowly at ordinary temperatures and pressures and more rapidly at elevated temperatures. Reaction products at 80 deg and above have an average nitrogen content less than that of the compound S2N2O9. Curves representing the course of this reaction reached a plateau long before it had been formed. The reaction does not take place if the gases are placed in contact at sufficiently low pressure. In the presence of catalysts, the reaction is very rapid but does not go to completion even at low pressures.

14624

Rozlovskiy, A. I. and Ye. P. Rodin

HIGH-TEMPERATURE CHILLING OF NITROGEN OXIDES. (Vysokotemperaturnaya zakalka okisi azota). Text in Russian. Doklady Akad. Nauk SSSR, 177(2):397-400, 1967. 9 refs.

This thermodynamic analysis of nitrogen oxidation, based on the literature, is directed toward an understanding of the effects of 'chilling' of the reaction products at high temperatures. Cooling rate as a function of temperature is plotted over the range 1900-4200 K for an equimolar N2-O2 mixture at 1 atm for an NO concentration of 15%. Nitrogen oxide losses during chilling are tabulated for temperatures ranging from 2663 to 4000 K at pressures of 0.77, 1, and 10 atm, with an O2-N2 ratio of 1:1, 1:4, or 1:10, and chilling rates ranging from 20,000 to 100,000,000 deg/sec.

14636

Rogers, E. and B. H. Sage

SOME STUDIES OF THE OXIDES OF NITROGEN. Office Naval Res., Monthly Res. Rept., p. 23-25, Jan. 1952. 9 refs.
ATI: 139788

An evaluation of the specific volume, thermal conductivity, and viscosity of the liquid phase of nitrogen dioxide and its mixtures with nitric oxide show that these compounds are suitable oxidizing components for binary liquid propellant systems. The compressibility of saturated nitrogen dioxide first increases, then decreases with a progressive rise in temperature. This anomaly is not present in the case of the

liquid, where specific volume is a function of pressure and temperature. Under usual operating conditions, the vapor pressure of nitrogen dioxide will remain below 100 psi. The relatively high freezing point of nitrogen dioxide is effectively lowered by solutions of nitric oxide, which increase two-phase pressure. Twenty wt% nitric oxide increases the bubble point pressure of nitrogen dioxide mixtures to 445 psi at 180 F. The vapor pressure of pure nitrogen dioxide at this temperature is about 196 psi. Nitric oxide is more nearly a perfect gas than nitrogen dioxide, deviating only about 5% from the behavior of a perfect gas at pressures up to 2500 psi at 100 F. Its compressibility factor is a function of pressure for several temperatures. Neither nitrogen dioxide nor nitric oxide undergoes significant decomposition when stored in steel containers.

14675

Neumann, Bernhard and Heinrich Kunz

THE REACTION IN THE HARGREAVES PROCESS. (Die Reaktion beim Hargreaves-Prozess). Text in German. Z. Angew. Chem. (Weinheim), 42(47):1085-1087, Nov. 23, 1929. 5 refs.

The reaction of the Hargreaves process (2NaCl plus SO2 plus H2O plus O yields Na2SO4 plus 2Hcl) was studied in the absence of oxygen. First the equilibrium constant was determined with Nernst's formula and it was found that very little HCl is formed. Next, experiments were conducted in a glass pipette ending in a capillary tube and containing a 10 cm-long layer of NaCl and platinum asbestos over which measured amounts of a mixture of water vapor and sulfurous acid were passed at temperatures from 350 to 600 C. The quantity of SO2 was varied and a slow gas velocity of 0.05 mole SO2/hr was selected. Generally, HCl increased with temperature at constant SO2 quantity. Comparison of the experimental results with the theoretical results showed a largely similar increase of the equilibrium constants with rising temperature, but the HCl measured was a hundred times larger than the quantity theoretically predicted. Further experiments yielded an explanation: in the reaction of SO2 and H2O with NaCl, sodium sulfite is formed at 500 C. If no oxygen is present, the sulfite is decomposed again. Sodium sulfate develops and sulfur is precipitated in an autooxidation-reduction reaction. In the presence of oxygen, the sulfite is oxidized to the sulfate without sulfur precipitation.

14688

Niedrach, L. W.

ELECTROCATALYSIS AND RELATED PROCESSES AT THE HYDROCARBON ANODE. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia., Pa., Nov. 1968, p. 487-524. 33 refs.

Several techniques were used to study oxidation reactions occurring at the hydrocarbon anode of low-temperature fuel cells using aqueous acidic electrolytes. They have provided information about surface species and reaction kinetics. Results indicate two major paths for such oxidations, both deriving the required oxygen from water in the electrolyte. The first, and preferred, path involves fission of carbon-carbon bonds to form C1 radicals. These rapidly react with water to form a partially oxygenated surface intermediate which in turn reacts further at moderate overvoltage to form CO2. The second path results in the formation of more refractory multi-carbon alkyl radicals on the surface. They are held to the surface by multipoint attachment and are more difficult to oxidize. Because of the many species present on the electrode surface and changes in coverage and composition with temperature, potential, and time, a study of the anodic oxidation of hydrocarbons requires many transient electrical measurements. Some of the techniques used in measurement may prove useful in connection with air pollution and abatement problems. (Author summary modified)

14747

Kirkwod, D. H. and J. Nutting

AN ELECTRON METALLOGRAPHIC INVESTIGATION OF THE OXIDATION OF LEAD SULFIDE IN AIR BETWEEN 200 AND 350 C. Trans. AIME (Am. Inst. Mining, Metallurgical, and Petroleum Engr.), 233(4):708-713, April 1965. 11 refs.

The oxidation of lead sulfide in air between 200 and 350 C was investigated by electron diffraction from thick sulfide films and from galena surfaces. The results showed that lead sulfate is stable in air up to about 570 C. Between 200 and 300 C, galena crystals were oxidized in air and the surface products were analyzed by electron diffraction. A film composed of very small crystallites of lead sulfate was initially formed over the surface. This was followed by the appearance of lead oxide in the form of needles. With longer periods of oxidation, a new diffraction pattern appeared which is believed to originate from lead tetraoxysulfate crystals. Above 300 C, the surface gave rise to a complex diffraction pattern which was not identified. The above sequence of products was explained by assuming that after a continuous film of sulfate is formed over the surface, only lead ions can readily diffuse to the top surface. This leads to the formation of lead oxide on the top surface while sulfur builds up in the kernel. When the sulfur reaches a pressure at which it erupts through the sulfate film, the supply of sulfur enables oxysulfate crystals to form. Certain crystals oxidized in the range of 200-300 C did not give this sequence of products. The initial sulfate pattern was followed by one arising from lead mono-oxysulfate. This behavior was found to be associated with surface impurities which were present before oxidation. It was suggested that these impurities prevent the continuous film of sulfate from being established, and sulfur is able to migrate to the top surface through breaks in the film. Mono-oxysulfate is formed as the supply of sulfurous gases decreases.

14815

Castellano, E. and H. J. Schumacher

KINETICS OF THE PHOTOCHEMICAL DECOMPOSITION OF OZONE IN 3130 A ULTRAVIOLET LIGHT. Institut Superior de Investigaciones, Buenos Aires, Argentina, Facultad de Quimica y Farmacia, Grant AF-AFOSR-979-65A, AFRPI-TR-69-42, 34p., Feb. 1969. 22 refs.
AD 683733

To better define its stability, the following selected routes of ozone decomposition were investigated; the photochemical decomposition of ozone by the use of an Hg-line 3130 A light source; the behavior of O (^1D) atoms as species possibly capable of initiating ozone decomposition; and the kinetics of the O (^1D) + O3 yields 2 O2 reaction in the presence of oxygen and inert gases. Results demonstrate that the maximum quantum efficiency is 6 for pure ozone and is not influenced by pressure, temperature, or light intensity. Addition of foreign gases decreases the quantum efficiency to a limiting value of 4 in an oxygen-free system. Water vapor increases the reaction rate very markedly. A mechanism for the photodecomposition of O3 is presented and shown to be consistent with the data selected. (Author abstract modified)

14854

Schoen, Richard I.

LABORATORY MEASUREMENTS OF PHOTOIONIZATION, PHOTOEXCITATION AND PHOTODETACHMENT. Boeing Scientific Research Labs., Seattle, Wash., Geo-Astrophysics Lab., D1-82-0768, 75p., Oct. 1968. 78 refs. (Presented at the Symposium on Laboratory Measurements of Aeronomic Interest, International Association of Geomagnetism and Aeronomy, Toronto, Canada, Sept. 3-4, 1968.)
CFSTI, DDC: AD 682082

Laboratory measurements of ionization, fluorescence, and photodetachment, limited to molecules of aeronomic interest but excluding atoms, are reviewed. Current data are presented on photoionization cross sections, cross sections for the excitation of particular states of ions, relative vibrational excitation probabilities, photodetachment cross sections, angular distributions of electrons from photoionization and dissociative excitation of neutral molecules. The following suggestions were made. At wavelengths where important solar lines lie within strong band structure, measurements of photoionization cross section of O2 and N2 with higher resolution may be required. Because of conflicting data on the photoionization cross sections of CO2, further investigation of the photoionization and photoabsorption cross sections may be required. More work is required on the details of ionization processes. The range of measurement should be extended to wavelengths shorter than 400 A. There is need for a set of accurate measurements at wavelengths of solar lines from

threshold to 100 A. These measurements must be made in a system unaffected by the angular distribution of the charged particles. More information is needed about angular distributions. The combination of electron energy, ion energy, and fluorescence measurements presents a powerful array for the analysis of photoionization phenomena. It appears that the most accurate cross sections for the excitation of those states which decay by fluorescence can be obtained by combining the best cross sections measured in electron energy experiments at 548 A with relative fluorescence efficiencies measured over a range of wavelengths of the exciting vacuum UV radiation. Dispersion of the fluorescent radiation is highly desirable, but care must be taken to check for polarization effects, which may be functions of the wavelength of the exciting radiation. In many cases, fluorescence represents the best method for detecting the existence of excited states. It would seem that much more work is required in the examination of fluorescence caused by vacuum UV radiation at all wavelengths of incidence and for more molecules of aeronomic interest.

14886

Chayanova, E. A. and K. S. Shifrin

THE SCATTERING INDICATRIX OF THE ATMOSPHERIC BOUNDARY LAYER. Bull. Acad. Sci. USSR, Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfer. i Okeana), 4(2):233-235, Feb. 1968. 4 refs.

The diagrams developed by Foitzik and Zschaeck are often used as aerosol indicatrix of the atmospheric boundary layer, but they exist only in the range of angles 16 to 164 deg or less than 10 deg. Values in the small-angle range must be determined by extrapolation. The formula used to check the validity of this extrapolation is based on the condition that the attenuation factor obtained in integrating the scattering indicatrix with respect to the solid angle, and that calculated according to the Kohschmieder formula are one and the same. It does not, in fact, allow the validity of extrapolation to 0 or 180 deg to be checked. Normalized scattering indicatrices for angles close to 0 and 180 deg and for visibilities 2 and 5 km are given. They are derived from a comparison of the Foitzik and Zschaeck diagrams with theoretical diagrams for power distribution. A power distribution is assumed to be in good accord with the available information on atmospheric aerosol structure.

14909

Bunkin, F. V., R. V. Karapetyan, and A. M. Prokhorov

DISSOCIATION OF MOLECULES IN A STRONG RADIATION FIELD. Soviet Phys. JETP (English translation from Russian of: Zh. Eksperim. i Teor. Fiz., 20(1):145-148, Jan. 1965. 6 refs.

The probability of dissociation of molecules in the radiation

field of a ruby laser, when the magnitude of the quantum of radiation is less than the dissociation energy, is considered. It is hypothesized that dissociation of polar diatomic molecules occurs by strong buildup of their oscillations, that is, by means of excitation of high vibrational states of the molecules with transition to the continuous spectrum. Analysis is carried out by perturbation theory, and the probabilities for two- and three-photon dissociation are calculated. Numerical estimates show that the dissociation process due to the proposed mechanism should be observable. (Author abstract modified)

14917

Jonathan, Neville

INFRARED SPECTROSCOPY APPLICATION TO CHEMICAL KINETIC SYSTEMS. Southampton Univ., Southampton, England, Dept. of Chemistry, Contract AF61(052)-886, Proj. 8658-03, AFCRL-69-0055, 20p., Oct. 21, 1968. 15 refs.
CFSTI, DDC: AD 683 772

Work carried out on atom-molecule and atom-atom reactions in the gas phase is reported. A zeolite pump was designed for studying the reactions at fast flow rates and low pressures. Results are given of studies on three light emitting reactions: atomic oxygen plus nitric oxide, atomic nitrogen recombination, and atomic oxygen plus acetylene. The mechanism by which ozone is adsorbed on silica gel was investigated using infrared absorption spectroscopy. Spectra were obtained for ozone, carbonyl sulfide, and sulfur dioxide adsorbed on an Aerosil pressed disc sample. In each case, a new band was detected at a lower frequency than that due to unperturbed hydroxyl groups, and the new band was found to increase in intensity as the latter decreased. Shifts were measured at various temperatures, and the results explained in terms of the formation of a hydrogen bond between the hydroxyl group on the adsorbent surface and the adsorbate molecule. The temperature dependence of the shift is also consistent with the known properties of the hydrogen bond. As the temperature is increased, the hydrogen bond becomes weaker, and the frequency of the hydroxyl band approaches the value for a free hydroxyl group. It is suggested that both ozone and sulfur dioxide are adsorbed on silica gel through their central atoms rather than through their terminal oxygen atoms.

15000

Bullrich, K., R. Eiden, G. Eschelbach, K. Fischer, G. Haenel, K. Heger, H. Schollmayer, and G. Steinhorst

RESEARCH ON ATMOSPHERIC OPTICAL RADIATION TRANSMISSION. THE TRIPLE SCATTERING AND THE INFLUENCE OF THE ANGULAR DEPENDENT REFLECTED RADIATION IN THE TURBID ATMOSPHERE. Johannes-Gutenberg-Universitaet, Mainz, Germany, Inst. fuer Meteorologie Contract F 61052-67-C-0046, AFCRL-69-0266, Final Report, p. 82-111: Jan. 1969. 38 refs.

The radiation on the earth's surface after triple scattering on gaseous and aerosol particles is computed for a homogeneous and plane parallel atmosphere. The calculations are discussed in detail. Theoretical treatment is applied to the reflectivity and albedo of the surface of the earth, reflection of direct solar radiation and sky light, and the attenuation of the reflected radiation by the atmosphere. The smooth curves and the computed intensity values plotted show distinct departures for triple scattering. This implies numerical instability at the integration processes which mainly result from the scattering function.

15019

Porter, G. and J. I. Steinfeld

GIANT-PULSE-LASER FLASH PHOTOLYSIS OF PHTHALOCYANINE VAPOR. J. Chem. Phys., vol. 45:3456-3457, 1966. 6 refs.

Flash photolysis was conducted on phthalocyanine gas to investigate the radiationless processes. Conventional flash photolysis, using a 220-J discharge through flash tubes filled with 3 torr of oxygen, produced a depletion of singlet absorption followed by extremely rapid recovery, faster than could be resolved by the apparatus. When a Q-switched ruby laser flash passed through the vapor, a large, fast depletion of absorbing molecules was observed, followed by a slow recovery. The slow recovery is due to the vaporization of excess solid in the sample tube and subsequent diffusion of the vapor into the absorbing region; thus, the laser flash irreversibly decomposes a large fraction of the phthalocyanine molecules in its path. If the Q-switch is removed from the laser and the full 40-J pulse is passed through the sample, no decomposition is observed. This strongly suggests that a process involving two photons is responsible for the photodissociation. When a similar experiment is carried out in chloronapthalene solution at 25 C, the singlet absorption recovers more quickly, and there is apparently no photodissociation. A possible explanation for this, suggested by the observation that the flucrescence yield decreases by a factor of 77 in going from solution at 25 C to vapor at 450 C, is that the second photon is absorbed by a metastable state M1, which could be the lowest triplet or a singlet of different electronic symmetry, producing a state M2, which dissociates. Since the crossing rate has an apparent activation energy of 4.5-7.5 kcal/mole, this process will be favored at high temperatures. An additional effect which might be operative is the rapid relaxation of M1 by solvent. This mechanism is supported by our results for conventional flash photolysis of tetraphenylporphyrin at 310-350 C, which absorbs at 4010 A.

15024

Porter, R. N.

THEORETICAL STUDIES OF HCT-ATOM REACTIONS. I. GENERAL FORMATION. J. Chem. Physics, 45(6):2284-2291, Sept. 15, 1966. 23 refs.

Reactions of atoms excited translationally by photolysis or nuclear recoil (i.e., hot-atom reactions) offer information about collision dynamics different from that derived from studies of thermally activated processes. However, only approximate models have been available for interpreting hot-atom experiments. The imminent possibility of correlating hot-atom results with beam and thermal kinetic theory to obtain dynamic information and to test theoretical models necessitates a general theory without restrictive approximations. The theory developed in the present investigation is free of restrictions on the energy range and applicable to both the photochemical and nuclear recoil experiments. Unlike the neutron theory on which most theories of hot-atom chemistry are based, it takes into account both inelastic scattering and initial motion of target molecules. The temperature dependence of the integral-reaction probability is included in the formulation. The basic integral equation is solved by iteration for the integral reaction probability (relative yield) as a function of hot-atom energy.

15028

Ross, Robert T.

SOME THERMODYNAMICS OF PHOTOCHEMICAL SYSTEMS. J. Chem. Phys., 46(12):4590-4593, June 15, 1967. 21 refs.

A limit on the thermodynamic potential difference between the ground and excited states of any photochemical system is established by evaluating the potential difference at which the rate of photon absorption and emission are equal. If incident-light intensity and absorption spectrum are known, the potential difference can be calculated from the Planck law relationship. The actual potential developed may be evaluated if the quantum yield of luminescence is known. Knowledge of this potential is particularly useful in analyzing the energetics of photosynthesis. This process can be reversed. From knowledge of a luminescence spectrum, it is possible to infer the absorption spectrum of the species responsible. Given the order-of-magnitude estimates for the luminescence yield and the extinction coefficient, it is possible to calculate the chemical potential difference required to generate the luminescence. This procedure is useful in examining mechanisms in electroluminescence, chemiluminescence, and bioluminescence.

15045

Crosley, David R.

USE OF OPTICAL PUMPING TO DETECT FREE RADICALS DURING A GAS-PHASE PHOTOLYSIS. J. Chem. Phys., 47(4):1361-1368, Aug. 15, 1967. 32 refs.

An optically pumped system of rubidium was used as a probe to measure the concentration of free radicals present during the vacuum-ultraviolet photolysis of five hydrocarbons. The mechanism for this measurement is the reduction of the relaxation

time of the oriented rubidium in the presence of radicals, due to the large spin exchange interaction between the two species. Measurements were made at two different pressures each on methane, ethane, propane, butane, and isobutane and both relative and absolute approximate quantum yields for radical production were determined. Separate detection of hydrogen atoms during the photolysis, through spin exchange coupled electron spin resonance is discussed. This method of directly detecting free-radical intermediates appears to be a useful complement to standard experiments in which reaction mechanisms are deduced from analysis of final products of the photolysis. (Author abstract modified)

15046

Herkstroeter, William G. and George S. Hammond

MECHANISMS OF PHOTOCHEMICAL REACTIONS IN SOLUTION. XXXIX. STUDY OF ENERGY TRANSFER BY KINETIC SPECTROPHOTOMETRY. J. Am. Chem. Soc., 88(21):4769-4777, Nov. 4, 1966. 26 refs.

Conventional flash techniques were used to measure the acceleration of the decay of various sensitizer triplets in the presence of energy acceptors. An extensive study was made of the stilbenes and 1,2-diphenylpropenes as acceptors. The results are correlated with those obtained earlier in studies of the photosensitized cistrans isomerization of the same substrates. The reactivity in energy transfer remains remarkably high with these substrates even when the triplet excitation energy of the sensitizer is insufficient to produce any known optical transition of the substrates. The result is in good agreement with the hypothesis that flexible molecules can undergo "non-vertical" transitions to produce twisted geometric forms directly. (Author abstract modified)

15054

Douglas, A. E.

ANOMALOUSLY LONG RADIATION LIFETIMES OF MOLECULAR EXCITED STATES. J. Chem. Phys., 45(3):1007-1015, Aug. 1, 1966. 15 refs.

Certain excited states of molecules have anomalously long radiative lifetimes compared with the values calculated from integrated absorption coefficients. Using the properties of the stationary states, four mechanisms which may account for such anomalous lifetimes in collision-free molecules are presented. Although the four mechanisms bear a one-to-one relationship to those which have been discussed using semiclassical concepts, certain consequences of the more exact treatment do not appear in the semiclassical approach. In particular, it is shown that the two mechanisms which are most important for polyatomic molecules lead to highly perturbed energy levels and correspondingly complex spectra. The spectra of NO2, SO2, and CS2 molecules, which have anomalously long lifetimes, also

appear to have perturbed energy levels. This observation is in agreement with the concept that the long lifetimes arise from a mixing of the vibrational levels within one state or a mixing of the levels of two electronic states. An investigation of additional molecules should show further examples of anomalous lifetimes; it is expected that for some molecules, the various vibrational and rotational levels of one electronic state will show a wide range of lifetimes. It appears probable that all the effects attributed to intersystem crossing of collision-free molecules can also be treated in terms of perturbations of the stationary state of the molecule.

15055

Eisenthal, K. B., W. L. Peticolas, and K. E. Rieckhoff

LASER-INDUCED LUMINESCENCE AND DISSOCIATION IN BIPHENYL. J. Chem. Phys., 44(12):4492-4497, June 15, 1966. 16 refs.

The interaction of the radiation field of an unfocused ruby laser with molecules containing a phenyl-phenyl or benzyl-benzyl single bond gave rise to a new luminescence. This luminescence is linearly dependent on the molecular concentration and proportional to either the second or the third power of the laser intensity. Thus it appears that a multiphoton absorption is occurring. The absorption does not appear to involve the electronic states of the molecules. This luminescence occurs throughout the visible region and bears no resemblance whatever to either the normal fluorescence or phosphorescence. Because of the exceedingly high laser intensities or electric fields necessary for electronic dielectric breakdown it appears that this mechanism is not of importance. It is suggested that multiphoton vibrational excitation to a dissociative state of the molecule may occur which leads to molecular fragmentation. This process is followed by a chemiluminescent emission. A quantitative comparison of the experimental results with a theoretical treatment of multiphoton vibrational dissociation is made. (Author abstract modified)

15056

Sucov, E. W., J. L. Pack, A. V. Phelps, and A. G. Engelhardt

PLASMA PRODUCTION BY A HIGH-POWER Q-SWITCHED LASER. Phys. Fluids, 10(9):2035-2048, Sept. 1967. 43 refs.

Studies were made of the confinement in a magnetic mirror of plasmas produced by focusing a Q-switched laser beam on aluminum disks, foils, and spheres. High speed photographs show that, in the absence of a confining magnetic field, the plasma generated from ball targets is roughly symmetrical while one component of the plasma generated from flat targets is asymmetric and moves toward the laser with a velocity of about 10 to the seventh cm/sec. A second component, which is more nearly symmetric, expands with a velocity of approximately 2 times

ten to the sixth cm/sec. The expansion velocities are not appreciably reduced in a 14-6-14 kG mirror field. However, the duration of the luminosity from a slower constituent of the plasma increases from 1 microsec to about 5 microsec microwave interferometer measurements show an electron density of about 5 times 10 to the eleventh reciprocal cm at times as late as 50 microsec. Electrostatic probes verify that the maximum expansion velocity corresponds to an ion kinetic energy of about 1.4 keV. Time integrated spectra of the plasma show lines from Al(III). Microwave attenuation measurements lead to an apparent electron temperature of the order of 0.03 eV at times later than 1 microsec. Analysis of microwave data shows that radial density gradients probably exist in some plasmas. (Author abstract modified)

15071

Phelps, A. V.

THEORY OF GROWTH OF IONIZATION DURING LASER BREAKDOWN. In: Physics of Quantum Electronics. P. L. Kelley, B. Lax, and P. E. Tannewald (eds.), New York, McGraw-Hill, 1966, p. 538-547. 32 refs.

Theoretical calculations are made of the rate of growth of ionization by electron impact with atoms and molecules in the presence of an intense laser beam. The excitation and ionization coefficients are calculated using Holstein's formula for the free-free absorption coefficient and using previously determined elastic- and inelastic-scattering cross sections. The agreement with experimental measurements of the time of breakdown is satisfactory if one assumes that initiating electrons are readily produced by the laser and that some of the atoms or molecules excited by electron impact are immediately photoionized. Resolution of the photoionization theory will require experiments using a laser having a smoother time and spatial variation of intensity in the focal region than those previously used. (Author abstract modified)

15114

Polanyi, J. C.

PROPOSAL FOR AN INFRARED MASER DEPENDENT ON VIBRATIONAL EXCITATION. J. Chem. Phys., vol. 34:347-348, 1961. 16 refs.

An iraser is proposed which involves the inversion between vibrational states. The vibrational iraser facilitates the attainment of the necessary higher concentration of vibrational species, affords a wide frequency range, and in pulsed operation, improves possibilities as a coherent amplifier in view of the mean-life for spontaneous emission. Two types of vibrational inversion are distinguished, complete inversion with respect to an entire vibrational-rotational bands and partial inversion with respect to a restricted number of vibrational-rotational

transitions within a band. If the products of the chemical reaction as originally formed are in an inverted populated distribution, the experimental conditions which would be expected to favor the maintenance of a stationary condition of inversion are: (1) low temperature and pressure to minimize collisional deactivation, with fast flow beyond the reagent mixing point, and (2) a pulsed reaction followed by synchronized pulsed operation as an iraser. If the method of vibrational excitation does not result in an initial population inversion, a complete population inversion under stationary-state conditions might in principle be brought about by (3) specific depopulation of some vibrational levels below the highest populated level by inelastic collisions, or (4) by specific depopulation by chemical reaction of the vibrators within a limited range of vibrational levels below the highest populated level. In addition, (5) 'partial cooling' should be a more general method, though it only offers the possiblity of achieving partial inversion where none existed before.

15115

Epstein, L. M. and K. H. Sun

CHEMICAL REACTIONS INDUCED IN GASES BY MEANS OF A LASER. Nature, 211(5054):1173-1174, Sept. 10, 1966. 1 ref.

In the course of studying the heating of gases by laser light pulses, residual gases were analyzed and in some cases a significant change in composition was found. The gases irradiated were CH4, 10%CH4-90%N2, CO2, 20%CO2-80%D2, 73%H2-27%N2, 55%O2-45%N2, and solid graphite in H2. Although the temperature within the directly irradiated volume was sufficient to cause complete dissociation and ionization, the low overall energy requirements imply that the number of molecules decomposed far exceeded the number originally ionized, and that most of the molecules decomposed received their energy indirectly. The pattern of product formation is what would be expected from high temperature reactions rather than from ionizing radiation. Thus there cannot be a large contribution resulting from any mechanism which involves irradiation from the cold gas with ions or hot atoms from the plasma. The reactions which did occur proceeded with 10-20% energy efficiency. The work indicated that the giant pulse laser can be conveniently used to study very high temperature chemical reactions. Studies to establish the dependence of yield on intensity and configuration of focal spot would also determine the usefulness of the method as an absolute dosimeter or calorimeter for laser shots.

15118

Tiffany, W. B., H. W. Moos, and A. L. Schawlow

SELECTIVE LASER PHOTOCATALYSIS OF BROMINE REACTIONS. Science, 157(3784):40-43, July 7, 1967. 20 refs.

The nature and dynamics of a gaseous chemical reaction were

studied by monochromatic laser light-induced photocatalysis. This was the first reported photochemical reaction of bromine with light in the 14,400 reciprocal cm spectral region. High-resolution absorption spectra of samples of pure Br2(79) and pure Br2(81) and natural Br2 were taken with a scanning spectrometer. In spite of the extremely close spacing of the individual lines, the spectrum of natural Br2 and certain strong lines belonging to the pure isotopes were indicated. From the addition of fluorocarbons to the bromine, it was shown that the primary photochemical process was the formation of stable excited bromine molecules with energies 500-800 reciprocal cm below the dissociation level. Thus, the use of monochromatic tunable laser light provided the first evidence of a photochemical reaction of bromine in which excited molecules, not atoms, were formed in the primary process. The mechanism of the subsequent reaction consists of collisional dissociation of the excited molecules into atoms, which then initiated free-radical chains. A quantitative estimate of the collisional electronic relaxation rate for excited bromine molecules was obtained, and a new upper limit to the continuous absorption strength at 14,400 reciprocal cm was determined.

15122

Cosby, William Trevor and Clive Richard Smith

PROMOTION OF CHEMICAL REACTIONS BY ELECTRICAL DISCHARGE. (Holmes (W. C.) & Co. Ltd., Huddersfield, England) Brit. Pat. 1,009,331. 3p., Nov. 1965. (Appl. Nov. 12, 1960, 15 claims).

A method of inducing a chemical reaction is described in which the reactant is subjected to a diffused electrical discharge produced by the application of a high-frequency, high-voltage supply between a pair of electrodes having at least one dielectric screen imposed between them. The power of the diffuse discharge is greater than 7.2 watts/cu cm, as produced by a voltage of several KV and a frequency of several hundred Kc/sec. Such an electrical discharge may be applied with or without a catalyst being present. Each screen is formed from a dielectric material having a high melting or softening point in the case of local heating; quartz, fused silica, or ceramic or mica compositions can be used. By the insertion of the screen or screens between the electrodes, the discharge passes between each screen and each pair of electrodes, diffusing the discharge and preventing flash-over. To demonstrate the principle, the oxidation of sulfur dioxide to sulfur trioxide is described.

15138

Haught, Alan F., Russell G. Meyerand, Jr., and David C. Smith

ELECTRICAL BREAKDOWN OF GASES BY OPTICAL FREQUENCY RADIATION. In: Physics of Quantum Electronics. P. L. Kelley and P. E. Tannewald (eds), New York, McGraw-Hill Col, 1966, p. 509-519 9 refs.

The electrical breakdown, i.e., ionization, of gases by high-intensity optical frequency radiation was studied in argon, helium, and neon from 1 atm to 2000 psi and with both ruby and neodymium laser radiation. Studies of the attenuation of the incident laser beam were carried out, and it was established that the energy removed from the optical beam is not scattered at the laser frequency or reradiated by excited atoms but instead is absorbed by the breakdown plasma. The effects of diffusion-like losses on the breakdown threshold were examined by varying the focal volume within which the breakdown is formed. Experimentally, the breakdown threshold is inversely related to the dimensions of the focus volume, indicating that diffusion-like losses are present and play a significant role in the development of optical frequency breakdown. Studies of the focal volume dependence with neodymium irradiation show that for the larger focal volumes there is a pronounced minimum in the breakdown threshold vs pressure curves. Measurements for a given gas and focal volume were made with both ruby and neodymium radiation to determine the frequency dependence of the breakdown. Neodymium gives a lower breakdown threshold than ruby at low pressures. At high pressures, the neodymium data approach those for ruby as a result of the minimum observed with neodymium. (Author abstract modified)

15139

Tiffany, W. B.

SELECTIVE PHOTOCHEMISTRY OF BROMINE USING A RUBY LASER. J. Chem. Phys., 48(7):3019-3031, April 1, 1968. 46 refs.

Gas-phase photochemical addition of bromine to olefin molecules was studied by inducing the reaction with monochromatic light near 6940 A from a pulsed, tunable ruby laser. All previous photochemical reactions of bromine were induced with light at wavelengths shorter than 6800 A, and were found to proceed by means of free radical chains. The Br atoms initiating these chains are produced by direct dissociation of Br2 molecules upon absorption of light in the continuum. The present investigation shows that free-radical chains are responsible for the reaction at 6940 A, also. However, direct dissociation at this wavelength is found to be negligible, and the Br2 molecules are excited to individual bound levels 500 to 800/cm(-1) below the dissociation energy. Kinetic and isotopic evidence shows that the additional energy is furnished by subsequent collisions, so that about 1% of the excited Br2 molecules become dissociated and can initiate the reaction. The remaining excited Br2 molecules relax by collisions to the ground state at a rate somewhat higher than the gas-kinetic-collision rate. It was shown that selective laser excitation provides information about dynamic molecular processes which is not easily obtained using other methods. (Author abstract modified)

15140

Wilson, David J.

PHOTOCHEMICAL REACTIONS IN THE GAS PHASE AND SLATER'S "NEW

APPRCACH TO RATE THEORY". J. Chem. Phys., 38(5):1098-1104, March 1, 1963. 9 refs.

Slater's "New Approach to Rate Theory" is used to mathematically analyze two simple gas-phase photochemical mechanisms in detail. Quantum yields are calculated as functions of pressure, and the qualitative nature of the plots is discussed. Statistical methods are used to develop consistency theorems for checking experimental plots of quantum yield versus pressure against the theory. (Author abstract modified)

15166

Moruzzi, J. L., J. W. Ekin, Jr., and A. V. Phelps

ELECTRON PRODUCTION BY ASSOCIATIVE DETACHMENT OF O(-) IONS WITH NO, CO, AND H2. J. Chem. Phys., 48(7):3070-3076, April 1, 1968. 26 refs.

Electron currents produced in associative detachment reactions involving O(-) ions were detected and measured in an electron drift tube. The reactions studied were those between O(-) and NO, O(-) and CO, and O(-) and H2. The associative-detachment rate coefficients were obtained from analyses of the electron current waveforms. The results indicate that the associative detachment proceeds by a two-body process. The observed rate coefficients are consistent with results obtained from studies of O(-) destruction using mass spectrometric techniques. Associative detachment rate coefficients of 2.2, 6.5, and 7.5 times 10 to the minus 10th power cu cm/sec were measured at near-thermal ion energies for the O(-) plus NO, O(-) plus CO, and the O(-) plus H2 reactions, respectively. The average energy of the O(-) ions ranged from thermal up to 0.16 eV. A search for a reaction between O2(-) and CO was unsuccessful, indicating that the rate coefficient of this reaction is less than 10 to the minus 14th power cu cm/sec. (Author abstract modified)

15184

Large, L. N. and H. Hill

A COMPACT PULSED GAS LASER FOR THE FAR INFRARED. Appl. Opt., 4(5):625-626, May 1965. 4 refs.

Stimulated emission in the far infrared has been observed by a number of workers using pulsed electrical discharge through gases at low pressure. The spectrum is rich in oscillations between 16 and 120 microns when water vapor or heavy water vapor discharges are used; an oscillation has been reported at 337 microns using an HCN discharge. The power outputs from these laser sources far exceed anything previously obtainable for the far infrared. The resonators used in these experiments were several meters in length and the discharge tubes require subsidiary vacuum systems. To provide a more convenient source for this spectral region, a compact sealed-off laser was developed from the 4.8-m tube originally used. The source is

designed to operate at 27.9 microns to take advantage of the strong oscillation obtained from the pulsed water vapor discharge at this wavelength. This region of the spectrum may be particularly useful for Faraday rotation measurements of magnetic fields in plasmas. (Author introduction modified)

15197

Paulson, J. F.

SOME NEGATIVE ION REACTIONS IN SIMPLE GASES. In: Symp. Ion-Molecule Reactions in the Gas Phase, Robert F. Gould (ed.), Washington, D. C., American Chemical Society, 1966, p. 28-43. 20 refs. (Presented at the Am. Chem. Soc., 152nd Meeting, New York, N. Y., Sept. 12-13, 1966.)

Charge transfer and ion-atom interchange reactions of D(-) with D2O and of O(-) with O2, N2O, and NO2 were studied with a magnetic sector mass spectrometer. Competition between electron transfer and ion-atom interchange was observed in the production of O2(-) by reactions of O(-) with O2, an endothermic reaction. The negative ion of the reacting molecules is formed in O2, N2O, and NO2, but not in D2O. Rate constants were estimated as a function of repeller potential. These studies are considered preliminary in the sense that the rate constants obtained are averages over a wide range of interaction energies and may not apply to ions having well-defined kinetic energies. Definitive tests of the dependence of these rate constants upon kinetic energy can only be carried out using ion beam techniques in which angular distributions of the products are measured. (Author abstract modified)

15225

Miescher, E.

ANALYSIS OF THE SPECTRUM OF THE NITRIC OXIDE MOLECULE. (Basel Univ. (Switzerland), Dept. of Physics, Grant AF-EOAR-65-74, AFCRL-69-0268, 9p., April 15, 1969. 17 refs.
DDC: AD 689 398

The vacuum-ultraviolet absorption spectrum of four different isotopes of nitric oxide gas was photographed with the most powerful existing spectrographs. The infrared and the visible emission spectrum emanating from a discharge through rapidly streaming NO also was recorded with very large instruments. In the vacuum-ultraviolet, it was photographed with a 1 meter grating. Comprehensive rotational analyses of the many band structures observed on the plates were carried out. The result of the investigation is the knowledge of the excited states of the NO molecule exceeding the present knowledge for any other molecule as far as completeness and theoretical understanding is concerned. Several novel features in band structures could be studied, particularly electronic interactions and extreme Rydberg state uncoupling. Important molecular constants could be derived with high accuracy. (Author abstract modified)

15227

Niles, F. E.

AIR-LIKE DISCHARGES WITH CO2, NO, NO2, AND N2O AS IMPURITIES. Ballistic Research Labs., Aberdeen Proving Ground, Md., BRL-R-1437, 73p., June 1969. 14 refs.
AD 690816

Computer solutions to 24 times-rate-of-change equations were obtained for air-like discharges attainable in a laboratory designed for the study of reactions of ionospheric importance. The manner in which the solutions are affected by initial number densities of CO2, NO, NO2, and N2O, corresponding to the impurity levels of 0, 0.1, 10, and 1000 ppm, is presented. Solution of the time-rate-of-change equations demonstrated the importance of knowing the initial concentrations of minor constituents. The initial N2O densities did not affect the solutions. The initial CO2 densities are not very important to the solutions. The CO3(-) solutions are influenced by the ozone density, which is affected by the NO2 density. The initial NO2 density greatly affects the reactions forming the negative ions. The initial NO density greatly affects the observable positive ion densities. While the solutions were obtained for the laboratory facility, similar effects on the charged particles in the upper atmosphere can be expected for various densities of NO and NO2. Hence, measurements of the NO and NO2 densities should accompany charged particle measurements in the upper atmosphere.

15235

Eichmeier, J.

MOBILITY SPECTROGRAMS OF NATURAL ATMOSPHERIC IONS FOR THE REGION OF SMALL AND MEDIUM-SIZED IONS. Z. Angew. Phys., 23(4):256-260, 1967. 13 refs. Translated from German. Information Gathering Service, Cambridge, Mass., 10p., July 1968, AFCRL-68-0388.
CFSTI: AD 840566

Mobility spectrograms of natural atmospheric ions were made in the laboratory with an aspiration mobility spectrometer consisting of a cylindrical condenser with a single divided electrode and circular ion gas. The spectrograms are reproduced. Within the mobility range 0.05 less than k less than 2 sq cm/Vsec, the mobility spectrum of natural positive and negative ions, as recorded in a closed room, shows a current maximum within the range of small ions which is located at 1.4 sq cm/Vsec for positive ions and 1.8 sq sm/Vsec for anions. Different current maxima cannot be identified in the range of medium-sized ions. The recording of daily changes of the mobility spectrum of positive ions in the same mobility range extended over six days. The mobility spectrogram shows a distinct change over a whole day. The daily changes of the spectral distribution of small and medium-sized ions follow roughly parallel curves. The mobility spectrum of natural

positive and negative atmospheric ions in the mobility range 0.0034 less than k less than 2 sq cm/Vsec for open windows is shown in a doubly logarithmic graph. The figure indicates that the complete mobility spectrum of natural atmospheric ions consists of only two concentration maxima: a small and narrow maximum in the region of small ions and a wide and high maximum in the region of large ions.

15243

Meijer, H. J.

THE PHILIPS-STIRLING ENGINE. (Der Philips-Stirlingmotor). Text in German. Motortech. Z. (Stuttgart), 29(7):284-298, July 1968. 14 refs.

The development of the Philips-Stirling engine is described and its advantages are enumerated. The engine is based on the principle of moving gas back and forth between a hot chamber and a cold chamber by a displacement piston. Development of the Stirling principle began in 1938 in the Philips research laboratories with the construction of small hot-air engines. Through the invention of the double acting engine, the path to larger Stirling engines was opened. Development of the rhombic gear in 1953 permitted operation with a pressureless crankcase. Hydrogen and helium replaced air. The engine efficiency could be raised to 38%, the specific power to 110 hp referred to the piston displacement volume. Better gaskets improved the longevity of the engine. The problems of thermal tension and heat transfer have been solved. Laboratory models of 10, 40, and 90 hp per cylinder have been built and tested while experiments on a model with 400 hp per cylinder are under way. A Stirling engine performs as well as or even better than a diesel engine. If the Stirling engine is driven with a fossil fuel, the exhaust gases are quite clean. They contain no CO or hydrocarbons owing to a steady combustion in a chamber fenced in by hot walls. Concentrations of NO and NO2 are low. A table comparing the exhaust gas composition of the Stirling engine with a gas turbine indicates this quite clearly. The reason for the reduction in emissions is not fully understood since flame temperatures in the burner are very high. To study the relationship between the temperature of the preheated air and the NOx content, an electrically driven air preheater was installed in a 90 hp one-cylinder engine. It was found that the NOx content decreases with decreasing temperature of the preheated air. If part of the exhaust gas is returned to the combustion air, the NO content can be further reduced.

15253

Young, R. A., G. Black, and T. G. Slanger

VACUUM-ULTRAVIOLET PHOTOLYSIS OF N2O. III. REACTION RATES OF O(S1). J. Chem. Phys., 50(1):309-311, Jan. 1, 1969. 13 refs. (Also: Stanford Research Inst., Menlo Park, Calif., Contracts Da-31-124-ARO-D-434 and DA-31-124-ARO-D-446 and Grant 544, Repts. 5134.11-P and 6093.11-C, 1969.)
AD 686936

Photolyses of N2O at 1470 A (Xe resonance lamp) and CO2 at 1048 + 1067 A (argon resonance lamp) were used as sources of O(S 1) atoms. Quenching rate coefficients for this species relative to those for N2O or CO2 were determined for a wide variety of gases (NO, C2N2, O2, CO, H2, CH4, N2, Ar, He, ethylene, and acetylene).

15259

Moyes, A. J. and C. R. Smith

COMPARATIVE RESULTS FOR THE THERMAL AND ELECTRONIC ACTIVATION OF MIXTURES OF SULPHUR DIOXIDE AND OXYGEN. Chem. Eng. (Londcn), 43(190):163-166, July-Aug. 1965. 7 refs.

Experiments in gas electrolysis are reported. Oxidation of sulfur dioxide to sulfur trioxide was investigated in a nondisruptive electrical discharge cell at atmospheric pressures and below. The experimental results are compared with published data for the catalytic reaction. With thermal reactions the volume of catalyst required to achieve conversion rises rapidly with an increase in sulfur dioxide concentration in the gases. With electronic activation the increase in reactor volume is less pronounced, and is proportionate to the sulfur dioxide flow rate. The rate of thermal oxidation of sulfur dioxide increases linearly with the oxygen content of the mixture. The sulfur dioxide concentration is critical in discharge reactions. Excess oxygen has no effect on the sulfur trioxide yield. It is suggested that in the discharge, electronic activation of the gas molecules occurs in the gas phase and that the overall reaction rate depends on the difference between two apparently first-order reactions. Although it is shown theoretically that electronic activation may be more efficient than thermal activation, it is unlikely to have industrial potential for exothermic reactions for which a suitable catalyst is commercially available. (Author abstract modified)

15272

Young, R. A., G. Black, and T. G. Slanger

VACUUM-ULTRAVIOLET PHOTOLYSIS OF N2O. II. DEACTIVATION OF N2(A 3(SIGMA SUB U)+) AND N2(B 3(PI SUB G)). J. Chem. Phys., 50(1):303-308, Jan. 1, 1969. 27 refs. (Also: Stanford Research Inst., Menlo Park, Calif., Contracts DA-31-124-ARO-D-434 and DA-31-124-ARO-D-446 and Grant GA-544, Repts. 5134.10-P and 6C93.10-C, 1969.)
AD: 687C64

Quenching of N2(A 3(sigma sub u)+), produced during photodissociation of N2O by 1470 A radiation, was studied using the NO gamma-band emission as a monitor. The relative quenching efficiencies of a variety of gases are given. At 1236 A, the state of N2(B 3(pi sub g)) was produced during photolysis of N2O and the variation of the intensity of N2 first positive

emission with N2O pressure was used to evaluate the quenching rate of N2(B 3(pi sub g)) by N2O. The value obtained was 1.6 times 10 to the minus 10th cc/molecule/sec. Quenching efficiencies for other gases (NA3, NO, C2N2, O2, CO, CO2, H2, CH4, N2, Ar, He, ethylene, and acetylene) were determined relative to N2O and are given. (Author abstract modified)

15281

Antonini, Eraldo

KINETIC STUDIES ON HOMOPROTEINS BY FLASH PHOTOLYSIS. Rome Univ. (Italy), Instituto di Chimica Biologica, Grant AF EOAR 68-0004, Final Rept. AFOSR 69-0400TR, 5p., Jan. 31, 1969. 3 refs.
AD 683715

The reaction kinetics of CO-heme with apoperoxidase were studied in a rapid mixing-flash photolysis experiments. It was found that the combination of CO-heme with apoperoxidase is a very fast process. The compound formed was combined with CO and it was found that after a few milliseconds, the kinetics of the CO reaction are the same as that of natural peroxidase. Myoglobins reconstituted from globins and hemes differing from protcheme in the side chains 2 and 4 of the porphyrin were obtained, and the kinetics of the reaction of myoglobin with CO were studied. The rate constants for combination with CO of proto-, meso-, and deuteromyoglobin are in the ratio of 1:1:3 for the products obtained from whale myoglobin. The reconstituted products from Aplysia myoglobin gave rates corresponding to the ratios of 1:1:50. Thus, the effect of substituting hemes differing from protoheme depends on the type of protein used in the reconstitution. The rates of combination of the isolated chains of human hemoglobin with oxygen were also measured by flash photolysis and stopped-flow methods. A significant discrepancy was noted in the association rates in the case of the beta chains. The functional properties of a hemoglobin carrying only heme on the alpha chains were investigated. The protein showed nearly hyperbolic oxygen equilibrium curves with 3-10 times higher oxygen affinity than normal hemoglobin, depending on the pH. The Bohr effect is present but is about one-half that of normal hemoglobin. The oxygen binding behavior of the hemerytrin of Sipunculus nudus was studied. The oxygen equilibrium showed only a slight site-site (homotrophic) interaction; there was no Bohr effect. The dissociation of oxyhemerytrin in the presence of sodium dithionite does not adhere to strict first-order kinetics but tends to slow down as the reaction proceeds.

15317

Hagopian, Erivan

INSTRUMENT FOR DETERMINING OZONE. (Cabot Corp., Boston, Mass.) U. S. Pat. 3,464,797. 3p., Sept. 2, 1969. 2 refs. (Appl. Oct. 26, 1966, 5 claims).

A process for measuring the quantity of ozone in multicomponent gas streams entails catalytically decomposing ozone to oxygen, dissipating the heat of the reaction, and measuring a difference in thermal conductivities. The apparatus in which the process is carried out provides for the separation of the ozone-bearing gas into two substreams. One stream flows directly to the first of two thermal conductivity cells, while the other flows through a bed of activated charcoal on which decomposition occurs before it is carried to the second cell. Since equilibrium is maintained by a simple heat exchange, the apparatus can be calibrated more easily and less frequently than existing analyzers. Decomposition can be carried out over a broad temperature range.

15380

Kraus, K., W. Mueller-Duysing, and H. Neuert

COLLISIONS OF SLOW NEGATIVE IONS WITH CHARGE TRANSFER. Air Force Cambridge Research Labs., Bedford, Mass., Office of Aerospace Research, Report AFCRL-68-0580, 9p., Nov. 1968. 6 refs. Translated from German. (Also: Z. Naturforsch, vol. 16a: 1385-1387, 1961.)
CFSTI: AD 844772

A mass spectrometer was used to observe collision processes of slow ions with other gas molecules in which charge transfers occurred. It was found that collisions of CS(-) ions with SO2 molecules lead to SO2(-) and collisions of NH2(-) with SO2 or CS2 molecules lead to SO2(-) and to CS2(-). Estimates of the different electron affinities (EA) indicate that EA(SO) is about 1 eV and EA(SO2) is only 0.1 eV greater at the most. (Author abstract modified)

15438

Ross, Robert T.

THERMODYNAMIC LIMITATIONS ON THE CONVERSION OF RADIANT ENERGY INTO WORK. J. Chem. Phys., 45(1):1-7, July 1, 1966. 12 refs.

Factors affecting solar-energy conversion in photoelectrical and photochemical systems are reviewed. Sources of inefficiency in the transformation of light into work that can be considered in thermodynamic terms: are (1) directional radiation incident on a nondirectional absorber; (2) irreversibility necessary to get a directional flow of energy into work or free-energy storage; (3) internal resistance losses; and (4) energy leaks from the absorber. Efficiency, as defined by the amount of power stored, is most significantly affected by control of the thermodynamic potential at the locus of free-energy storage; indirectly, this means control of the absorber temperature. The latitude in this control for good efficiency in a photochemical system is given. Absorber directionality and absorber relaxation rate must change by at least an order of magnitude to significantly affect the thermodynamically limited maximum efficiency. The loss due to

absorber relaxation in a given chemical system can be minimized by an appropriate choice of optical density for the absorber. Internal resistance losses can be reduced by removing some of the resistance, but the significance of such a reduction depends on the degree of saturation. An understanding of these sources of inefficiency is useful in designing radiation converters, and devising a simple photochemical system for the effective capture of solar energy. Relationships are developed for narrow-band absorption, and application to broad-band systems is discussed briefly. Information useful to biological photosynthesis can be obtained by studying the efficiency of a radiation-conversion system, or its chemical potential and fluorescence yield parameters, as a function of variables considered here. (Author conclusions modified)

15470

Snelling, David R. and Edward J. Bair

DEACTIVATION OF O(D 1) BY MOLECULAR OXYGEN. J. Chem. Phys., 48(12):5737-5738, June 15, 1968. 5 refs.

Measurements of the effectiveness of O2 in the rate of deactivation of O(1-D) by various gases are reported. The data show that O2 has no detectable effect on O(1-D) under the range of conditions studied, placing an upper limit of 2 times 10 to the 8th liter/mole sec on the rate of deactivation of O(1-D) by O2. Analysis of the data presumes that significant zone decomposition during the first few hundred microsec following flash photolysis of a dilute, low-pressure ozone-inert gas mixture is limited to certain processes. According to the data, O2 behaves as an inert gas. The trend in the data is toward an increase in the O3 decomposed rather than the decrease to be expected if O2 were an efficient deactivator. Experiments were performed to determine the extent to which oxygen photolysis influences the result. The ozone absorbance several seconds after the flash indicates that a small amount of O2 is photolyzed. This could possibly account for a small increment in the amount of ozone decomposed at 300 microsec, but definitely could not be sufficiently extensive to obscure the extent of deactivation of O(D 1) by O2.

15486

Woods, F. J., M. E. Umstead, and J. E. Johnson

VAPOR-PHASE OXIDATION OF HYDROCARBONS. PART 2 - EFFECT OF OXYGEN CONCENTRATION ON PLATINUM-CATALYZED COMBUSTION AND IONIZATION. Naval Research Lab., Washington, D. C., Chemistry Div., Contract NRL Problem C 01-03, Proj. RR 001-06-41-5850, NRL Rept. 6816, 16p., Feb. 7, 1969. 13 refs.
AD 684072

The catalytic combustion of hydrocarbons was studied with particular attention given to the ionization phenomena

associated with it. The greater ion yield of highly branched alkanes relative to straight chain alkanes was confirmed. The effect of the concentration of oxygen in the gas mixture on the extent of oxidation and ionization varied with the hydrocarbon used. In general, increase in O2 content caused considerable enhancement of the ion yield. However, with some hydrocarbons such as 2,2-dimethylpropane and 2,2-dimethylbutane, the fraction oxidized decreased markedly with increased O2 concentration in the temperature range, 400-700 C. The data seemed consistent with an explanation based on lower temperature oxidation occurring only on the platinum surface, whereas at higher temperatures the catalytic process extends itself to some degree into the vapor phase. It is also suggested that dissociative adsorption of O2 at higher temperatures is involved in the ion-producing process. (Author abstract modified)

15491

Novak, J. R. and M. W. Windsor

LASER PHOTOLYSIS AND SPECTROSCOPY IN THE NANOSECOND TIME RANGE: EXCITED SINGLET STATE ABSORPTION IN CORONENE. J. Chem. Phys., 47(8):3075-3076, Oct. 15, 1967. 5 refs.

Laser photolysis apparatus with a spectroscopic source, capable of recording the spectral absorption of transient species in the nanosecond time range, was developed and used to study the first excited singlet state of coronene. Coronene showed a laser line at 347 nm and fluorescence between 410 and 480 nm. Ground state absorption bands of coronene were in the 320-350 nm region. Using both excitation and background pulses, the middle exposure showed heavy bleaching of the ground-state absorption bands and a new absorption in the 500 nm region with a peak at 520 nm. The 520 nm band decayed at the same rate as the fluorescence and was concomitantly replaced by triplet bands growing in at 480 and 390 nm. This was considered unequivocal confirmation that absorption by the S 1 state is responsible for the 520 nm band. This technique is faster by about two orders of magnitude than current flash-spectrographic instrumentation and extends the studies of transient absorption spectra into the nanosecond range. By using calibrated plates or photoelectric recording, kinetic data can be obtained. This technique should have wide application to solid, liquid, and gaseous systems in searching for intermediates of very short life and increasing the understanding of photochemical primary processes.

15495

Atroshchenko, V. I., G. K. Goncharenko, and S. G. Sedasheva

KINETICS OF ABSORPTION OF NITROGEN DIOXIDE BY SOLID CALCIUM OXIDE. (Kinetika vbirannya dvookisu azotu tverdim okisom kal'tsiyu). Text in Ukrainian. Khim. Prom. Inform. Nauk Tekh. Zb., no. 1:27-29, Jan.-March, 1965. 1 ref.

Experimental study of the absorption kinetics for 10% nitrogen

dioxide over solid calcium oxide was made at 50-300 C. The absorption rate constant at these temperatures ranged from 0.0572 to 0.572, while the corresponding degree of absorption increased from 7.3 to 46.5%. These values were determined at 7-9% saturation of the absorbent, which occurred in 0.191-0.107 sec. Reducing NO2 concentration to 5% resulted in a 10-20% reduction in the degree of absorption. This reaction is recommended for production of calcium nitrate fertilizer.

15502

Gibert, Rene

CONDITIONS FOR THE POSSIBILITY OF ISOTOPE ENRICHMENT BY A PHOTOCHEMICAL REACTION. (Conditions de possibilite de l'enrichissement isotopique par une reaction photochimique). Text in French. J. Chim. Phys., 60(2):205-208, 1963. 9 refs.

The possibility of selective excitation by radiation of a single molecular species in a mixture and the effect of the vibrational energy on the rate of an intermolecular reaction are analyzed. By consideration of simple conceptual models of radiative excitation of a diatomic molecule under stationary conditions and a reaction between a monatomic and a diatomic molecule in equilibrium at the radiation temperature, two analytical expressions are derived. The following conclusions are drawn: 1) The first expression shows that the irradiation of a gas mixture by an appropriately chosen method effects selective excitation of the vibrations of a single molecular species in an isotope mixture; and 2) The considerable effect of the vibration temperature on the reaction rate, evidenced by the second expression, shows that it is possible to attain high separation factors with relatively slight temperature differences. Such an effect, in which the absorbed energy influences the reaction rate through the intervention of the vibration temperature of the molecule, cannot be properly called photochemical, but rather photothermal.

15536

Dodonova, N. Ya. and V. V. Sobolev

INFRARED EMISSION OF NITRIC OXIDE IN ELECTRICAL DISCHARGE. Vestn. Leningr. Univ., Ser. Fiz. i Khim., 2(10):3-5, 1956. 4 refs. Translated from Russian. Dept of the Army, Fort Detrick, Frederick, Md., 4p., Aug. 1956.
CFSTI, DDC: AD 682503

The emission of nitric oxide in an electrical discharge at pressures of 10-200 mm Hg was studied. Nitric oxide was produced by a solution of KNO_2 + KI reacting with dilute sulfuric acid and was dried with phosphorus pentoxide and sulfuric acid. The emission spectrum obtained from the discharge had maxima at 3, 4.4, and 4.8 microns. Comparison of the NO emission spectrum with the absorption spectra of NO showed that

the bands which were detected do not belong to NO, but to oxides of nitrogen formed in the discharge by decomposition of NO and by chemical reactions. The only exception may be the 3 micron band which could belong to NO. It was concluded that the addition of nitrogen to the nitric oxide in the discharge does not affect the emission intensity of the 4.8 micron band. This does not agree with previous views.

15667

Yur'eva, T. M., G. K. Boreskov, and V. Sh. Gruver

THE MECHANISM OF CARBON MONOXIDE CONVERSION OVER COPPER CHROMITE AND CHROMIUM OXIDE IN THE PRESENCE OF WATER VAPOUR. (Mekhanizm reaktsii konversii okisi ugleroda s vodyanym parom na khromite medi i okisi khroma). Text in Russian. Kinetika i Kataliz, 10(4):862-868, 1969. 8 refs.

Experiments were carried out to verify a two-stage scheme involving transfer of oxygen, first to the catalyst and then from the catalyst to carbon monoxide over copper chromite and chromic oxide catalysts. Direct measurements were taken of the rates of the oxidation and reduction stages. In each case, the two-stage reaction was not confirmed. In the case of copper chromite, it is proposed that the reaction proceeds by means of an active complex containing both CO and H2O molecules, possibly through the reaction of two adsorbed molecules, i.e., according to the so-called Langmuir-Hinchelwood scheme. In the case of chromium oxide, the reaction apparently proceeds by means of an active complex comprising both of the reagents. The fact that chromium oxide, unlike copper chromite, does not adsorb significant quantities of carbon monoxide suggests that the reaction takes place between adsorbed water molecules and gaseous CO.

15746

Jones, I. T. N. and R. P. Wayne

PHOTOLYSIS OF OZONE BY 254-, 313-, AND 334-NM RADIATION. J. Chem. Phys., 51(8):3617-3618, Oct. 15, 1969. 7 refs.

Evidence is presented which suggests that excited singlet O2 is formed at wavelengths longer than 310 nm. Quantum yield measurements for ozone photolysis gave indirect evidence for the production of O(D 1) and the singlet O2 at 254 nm. At 313 nm, singlet O2 is still produced, but most of the oxygen atoms are O(P 3); at 334 nm, the primary products are exclusively O(P 3) and singlet O2. The primary steps at 313 and 334 nm therefore appear not to give spin-conserved products, suggesting that spin-conservation rules may not apply when absorption is weak.

15755

Comtat, Maurice and Jean Mahenc

ELECTROCHEMICAL OXIDATION OF SULFUR DIOXIDE ON A PLATINUM ELECTRODE. (Oxydation electrochmique du dioxyde de soufre sur electrode de platine). Text in French. Bull. Soc. Chem. France, no. 11:3862-9, 1969. 23 refs.

Electrochemical oxidation of sulfur dioxide on a platinum electrode was undertaken by various potenticstatic and potentiodynamic methods. Two types of oxidation were evident: a purely electrochemical oxidation which depended essentially on the surface state of the electrode, and particularly on the state of reduction of the superficial film of platinum oxide generated eletrolytically; the second type of oxidation is linked with the presence of this platinum oxide which involves a phenomenon of passivation. Different mechanisms which are susceptible to passivation phenomena were proposed to account for the experimental results; a systematic method of calculating current-voltage curves is presented, using the coefficient of transfer and Temkin's factor as parameters.

15756

Navalles, Henri, Gerard Dorthe, and Michel Destriau

REACTION OF OXYGEN WITH NITROUS OXIDE. (La reaction de l'oxygene avec l'oxyde azoteaux). Text in French. Bull. Soc. Chim. France, no. 9:3088, 1969. 4 refs.

A study of the chemiluminescence that occurs when nitrous oxide and hydrogen react at temperatures and pressures of 726 C and 300 mm Hg and 820 C and 600 mm Hg, refutes the hypothesis that in the following sequence of reactions, the last two are of little significance: N2O + N2O yields N2 + O + N2O; O + H2 yields OH + H; O + N2O yields 2 NO; and O + NO yields NO2 yields NO2 + hv. It is concluded that it would be difficult to account for the luminous emission if the last reaction does not take place.

15785

Young, R. A., Graham Black, and T. G. Slanger

REACTION AND DEACTIVATION OF O(D 1). J. Chem. Phys., 49(11):4758-4768, Dec. 1, 1968. 26 refs. (AROC Contract DA-31-124-ARO-D-446 and DA-31-124-ARO-D-434, Rept. 5134.9-P.) AD 686018

Relative rates for quenching of O(D 1) to (P 3) and for removal of O(D 1) by reaction were measured for helium, nitrogen, argon,

nitrous oxide, hydrogen, nitrogen oxide, and carbon dioxide gases. The O(D 1) was produced by photolysis of O2 at 1470 A. The rates were determined by measuring the variation of the production rate of O(P 3) atoms as a function of the amounts of quenching and reactive gases added to the system. From the limits set by the lack of detection of the 6300 A line of the O(D 1) to O(P 3) transition, and the maximum rates of two-body reactions, the rate coefficients were put on an absolute basis. Except for Ar and He, all gases measured interact with O(D 1) with rate coefficients greater or equal to 4 times 10 to the minus 11th power cu cm/molecule/sec. (Author abstract modified)

15790

Young, R. A., Graham Black, and T. G. Slanger

VACUUM-ULTRAVIOLET PHOTOLYSIS OF N2O. I. METASTABLE SPECIES PRODUCED AT 1470 A. J. Chem. Phys., 49(11):4769-4776, Dec. 1, 1968. 25 refs. (AROD Contract DA-31-124-ARO-D-446 and DA-31-124-ARO-D-434, Rept. 5134.8-P.)
AD 686017

Various photometric techniques were used to obtain information about the reactions and quantum yields of the metastable species formed in N2O photolysis at 1470 A. The total quantum yield of atoms is 1.0; O(S 1) is produced with a quantum yield of 0.5; and O(D 1) has a measured quantum yield of 0.55, although this value may include electronically quenched O(S 1). The N2(A 3 sigma) quantum yield is 0.08, which, from spin considerations, must also be equal to the O(P 3) yield. The N2(D 2) that is produced reacts with N2O, (apparently quite inefficiently) to give NO(B 2 pi). (Author abstract modified)

15808

Antonini, Eraldo, Maurizio Brunori, Jeffries Wyman, and Robert W. Noble

PREPARATION AND KINETIC PROPERTIES OF INTERMEDIATES IN THE REACTION OF HEMOGLOBIN WITH LIGANDS. J. Biol. Chem., 241(13): 3236-3238, July 10, 1966. 9 refs.

Progress in understanding the mechanism of the reaction of hemoglobin with ligands can be made by studying the properties of the reaction intermediates. A method is described for preparing stable forms of these intermediates by reassembling hemoglobin from its respective deoxygenated and liganded chains. By taking advantage of the very slow dissociation of NO, compounds containing the species (alphaNO - beta) or (alpha -betaNO) are obtained by mixing NO chains with their deoxygenated partners. The kinetic behavior of these intermediates with CO can then be studied and compared with that of the isolated chains and of the fully unliganded chains. Experiments with CO show that the

liganded isolated alpha or beta chains are able to react with their deoxygenated partners in stoichiometric amounts. The compounds which are formed are of the type (alpha-liganded beta-deoxy) or alpha-deoxy beta-liganded); they possibly have the same properties as the transient intermediates normally formed in the reaction of hemoglobin with ligands. The kinetic behavior of the deoxygenated chains in these compounds is similar to that of fully unliganded hemoglobin and wholly different from that of the isolated chains or from that of modified hemoglobins, which show no heme-heme interaction.

15817

Kon, Hideo

PARAMAGNETIC RESONANCE STUDY OF NITRIC OXIDE HEMOGLOBIN. J. Biol. Chem., 243(16):4350-4357, Aug. 25, 1968. 36 refs.

The electron paramagnetic resonance absorption of nitric oxide hemoglobin was studied as a possible model system for oxyhemoglobin. The electron paramagnetic resonance spectrum showed three g factors, indicating a rhombic symmetry around the paramegnetic center. When N(15)O was used, the unimpaired electron was found to be hardly associated with NO nitrogen was assumed. Modifying NO-hemoglobin with sodium dodecyl sulfate (SDS) shifted the whole spectrum toward a lower magnetic field retaining the rhombic symmetry. The N(14) hyperfine structure was then resolved in one of the peaks with the splitting of 15 gauss. The number of SDS molecules required to complete this transformation equalled the number of the basic amino acid residues. At SDS concentrations greater than 0.2 M further transformation of the spectrum took place indicating the randomization of the structure and the change of symmetry type around the paramagnetic center from rhombic to axial. NO-hemoglobin powdered specimen after dehydration gave a spectral pattern indistinguishable from that of the SDS-modified NO-hemoglobin. This spectral conversion to dehydrated type was reversed by evacuating and replenishing H2O vapor. Interaction with 0.03 to 0.5 M sodium salicylate decreased absorption, with concomitant appearance of four new peaks presumably due to a low spin Fe(III) type electronic configuration. The possible implication of the rearrangement of the electronic state is discussed in connection with the known oxidase-like activity of oxyhemoglobin under similar conditions. (Author summary modified)

15829

McCaa, D. J. and J. H. Shaw

THE INFRARED SPECTRUM OF OZONE. J. Mol. Spectr., 25(3):374-397, 1968. 18 refs.

Fourteen bands of ozone between 500 and 3300 reciprocal cm were identified and values of the vibrational anharmonic constants

were determined. The integrated band absorptances (IBA) of many of these bands were measured from spectra of a 32-m path of ozone-oxygen mixtures containing up to 30 atm cm ozone near 25 C. The dependences of the band absorptances on the ozone concentration and total pressure are described. The strengths of nine of the bands are given. It is shown that a statistical band model describes the behavior of the bands reasonably well. However, if an accuracy of better than 10% is required, more precise descriptions are required. These can be obtained by fitting empirical expressions containing more than two constants or by applying the band models to narrow spectral intervals in the band rather than to the entire band.

15833

Decius, J. C.

INFRARED FREQUENCIES AND INTENSITIES OF SULFATE ION IMPURITIES IN KBR CRYSTALS AND THE THEORY OF THE VIBRATIONAL STARK EFFECT DUE TO INTERNAL FIELDS. Spectrochim. Acta, 21(1):15-22, 1965. 5 refs.

The complete fundamental spectra of CaSO4, SrSO4, and BaSO4 ion pairs in KBr are presented. All eight fundamental modes allowed for a sulfate ion under C(2u) (u stands for upsilon) selection rules were found in specimens of KBr doped with CaSO4, SrSO4, and BaSO4. This indicated the formation of ion pairs in which M(2+) and SO4(2-) occupy nearest neighbor positions in the rocksalt lattice. Other species of sulfate were observed, but were incompletely identified. The splitting of the triply degenerate modes v3 and v4 (v stands for frequency, nu) was treated on the basis of a vibrational Stark effect arising from the intense electric field due to the excess charge on the alkaline earth ion. The theory relates the splittings to the anharmonic constants in the potential function of SO4(2-), and to the dipole derivatives of the infrared active modes. Although there are too many parameters for a complete solution, the order of magnitude of the cubic potential constants as estimated from the observed splittings is shown to be very reasonable. (Author abstract modified)

15911

Yamate, Noboru

PHOTOCHEMICAL STUDIES OF AIR POLLUTION. II. STUDIES ON PHOTOCHEMICAL PRODUCTS OF AUTO EXHAUST. (Taiki osen no kokagaku kenkyu (dai 2 ho) jidosha haiki gasu no koshosha seiseibutsu ni tsuite). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 15(4):248-252, 1969. 5 refs.

Automobile exhaust was irradiated with xenon or solar light under static conditions, and the concentration changes of hydrocarbons, nitrogen oxides, formaldehyde, and irradiation products were

analyzed. Hydrocarbon concentrations were determined by hydrogen-flame ionization gas chromatography; nitrogen oxides and formaldehyde concentrations, by colorimetry; and irradiation products, by electron-capture gas chromatography. Irradiation decreased the concentrations of hydrocarbons and nitrogen oxides but increased formaldehyde concentrations. The irradiation products were methyl nitrite, ethyl nitrite, methyl nitrate, ethyl nitrate, n-propyl nitrate, isobutyl nitrate, biacetyl, and peroxyacetyl nitrate. These photochemical reactions of auto exhaust presumably occur in the atmosphere.

15986

Cassano, A. E., P. L. Silveston, and J. M. Smith

PHOTOCHEMICAL REACTION ENGINEERING. Ind. Eng. Chem., 59(1):18-38, 1967. 72 refs.

The state of the art of the design of photoreactors is reviewed and reactor design problems are mathematically defined. Complex rate equations are derived for chain kinetics, radiation energy conservation, wall reactions, radial gradients, wall deposits, and effects of wavelength distribution, all of which affect conversion in a reactor. It is emphasized that a rate equation for photochemical process rates cannot be formulated independently of transport processes. Rates for photokinetics must consider wavelength effects, reaction mechanisms, heterogeneous processes, diffusional effects, and correction for dark reactions. Both analytical and numerical solutions are proposed for design problems. The former can not be applied in cases where diffusion and dispersion effects are due to velocity and concentration profiles and complex kinetics. Analytical solutions can be obtained where only a single linear reaction is involved, with no wall reactions and a constant attenuation coefficient. If the radiation equation is linearized, a heterogeneous wall termination reaction can be included in the solution. For completely mixed reactions (without wall reactions) two-step reaction kinetics can be solved. Again, the radiation equation must be linearized. Numerical solutions of general equations may not be realistic because of limitations in machine computation and unavailability of numbers for parameters. However, a plug-flow model of isothermal, monochromatic conditions can be solved numerically with complex kinetics.

16036

Becker, H. G.

MECHANISM OF ABSORPTION OF MODERATELY SOLUBLE GASES IN WATER. Ind. Eng. Chem., 16(12):1220-1224, Dec. 1924. 6 refs.

The absorption of oxygen and nitrogen in air-free water was studied under conditions allowing the absorption process to be

followed step by step from zero concentration of dissolved gas to saturation in both mixed and unmixed liquids. Experiments are also reported on the absorption of other gases of widely different solubilities in unmixed water. When liquid is kept mixed, the solubility of oxygen and nitrogen diminishes with increasing temperature and the percentage saturaton of the liquid increases with time. Observations on the absorption of oxygen in liquid stirred at varying speeds indicate that absorption is proportional to time, i.e., the rate of solution is constant in water of zero oxygen content. When oxygen accumulates in the water, the rate of solution is proportional to the degree of unsaturation. In unmixed liquid, the rate of solution follows a regular course while the oxygen content of water is low, but becomes quite irregular when the water is 60 to 70% saturated. Gases such as carbon dioxide, hydrogen, and hydrogen sulfide form saturated layers at the surface of liquid, which cause the rate of solution to fall off rapidly. Gases such as nitrous oxide, nitric oxide, and chlorine show no tendency to form saturated surface layers and are absorbed at correspondingly higher rates.

16038

Gerlovin, Ya. I.

THE PROBABILITIES OF SPONTANEOUS RADIATION CORRESPONDING TO THE VIBRATIONAL-ROTATIONAL BANDS OF AMMONIA, ACETYLENE, AND SULFUR DIOXIDE. Opt. Spectry. (USSR) (English translation from Russian of: Opt. i Spektroskopiya), 23(6):535-537, Dec. 1967. 6 refs.

Rotational-vibrational bands of ammonia, acetylene, and sulfur dioxide were investigated by a method permitting the determination of the probability of spontaneous radiation corresponding to the bands. The reduction of the radiation current passing from a receiver to a heat sink when a radiating gas is in its path depends on the intensity of the absorption band. This method has several advantages over methods based on measurements of the absolute intensity of the bands. The sensitivity of the method used was increased by employing a heat sink consisting of a glass flask and cooling device. Calculated probabilities of radiation correspond to ammonia bands in the regions 6.15 and 10.3 micron; acetylene bands in the regions 7.5 and 13.7 micron; and sulfur dioxide bands in the regions 4.0, 7.3, 8.7, and 19.3 micron. Comparison of the probability values of the three gases shows that the deviation between them is small.

16043

Nichipor, G. V.

KINETICS OF THE RADIATION-THERMAL DECOMPOSITION OF NO2 IN FLOW. Vestsi Akad. Navuk Belarusk. SSR: Ser. Fiz, Tekhn. Navuk, no. 4:29-34, 1967. 19 refs. Translated from Russian by Stephen J. Amoretty, Brookhaven National Lab., Upton, N. Y., Information Div. BNL TR 223, 10p., Sept. 1968.

An attempt is made to describe the kinetics of the radiation-

thermal decomposition of nitrogen dioxide in one-dimensional flow. Formulas are given for 14 chemical reactions, produced by the action of heat and ionizing radiation, that govern one-dimensional flow. The distribution of mixture components in one-dimensional flow is described by a set of eight first-order differential equations with nonlinear right-hand terms. It is shown that at temperatures greater than or less than 500 K, the effect of radiation effects on the space-time distribution of mixtures can be neglected only at the very beginning of the chemical stage constituting the processes leading to the establishment of chemical equilibrium. Specific rates of 12 of the 14 chemical reactions are tabulated, and the ratio of the rates of the initial radiation and thermal decomposition of NO2 is plotted as a function of temperature at a dose output of 1 times 10 to the 16th power eV/cu cm/sec.

16045

Shiga, Takeshi, Kun-Joo Hwang, and Itrio Tyuma

AN ELECTRON PARAMAGNETIC RESONANCE STUDY OF NITRIC OXIDE HEMOGLOBIN DERIVATIVES. Arch. Biochem. Biophys., 123(1):203-205, Jan. 1968. 11 refs.

The electron paramagnetic resonance (EPR) spectrum of nitric oxide hemoglobin (Hb) derivatives was studied to determine the functional differences in terms of magnetic properties. Measurements were carried out at room temperature or at low temperatures. The EPR spectra of NO-Hb A, NO-Hb alpha, and NO-Hb beta were different from each other. The spectrum of NO-Hb beta was nearly symmetrical. An addition of the spectra for the alpha and beta subunits yielded a spectrum which was almost identical with that for Hb A. The EPR absorption decreased with the increase in temperature without changing the line shapes. The results indicated that the relaxation mechanism and temperature effect are the same in all NO-Hb's. Thus, the line shape differences between alpha and beta chains observed can be related to the altered orbital configuration of heme-NO part in the subunits.

16046

Shiga, Takeshi, Kun-Joo Hwang, and Itiro Tyuma

ELECTRON PARAMAGNETIC RESONANCE STUDIES OF NITRIC OXIDE HEMOGLOBIN DERIVATIVES. I. HUMAN HEMOGLOBIN SUBUNITS. Biochemistry, 8(1):378-383, Jan. 1969. 22 refs.

To elucidate the molecular conformation of a ligand bound to hemoglobin, nitric oxide derivatives of human adult hemoglobin and its subunits, alpha and beta, were studied by electron paramagnetic resonance spectroscopy. The spectrum of hemoglobin alpha-NO and beta-NO were dissimilar. The spectrum of erythrocytes NO and human adult hemoglobin NO were the arithmetic mean of the spectrum for the isolated subunits. At room

temperature, the signal of hemoglobin alpha-NO exhibited axial symmetry, whereas that of hemoglobin beta-NO slightly deviated from axial symmetry. Below -50 deg, however, the signal for both the subunits markedly distorted from axial symmetry. The approximate principal g values were estimated by comparing the observed spectra with simulated spectra calculated by a digital computer. For the simulation, a broad intrinsic line was assumed, which may be due to a freedom of the orientation of NO on heme. The estimated g values for hemoglobin alpha-NO and hemoglobin beta-NO changed with temperature discontinuously. The change in g values was considered to reflect an altered orientation of the NO molecule at room and low temperatures. Urea and high pH removed the steric or libration restriction on the NO molecule in hemoglobin beta-NO, giving a signal of nearly axial symmetry and/or broad intrinsic line width. The effect of temperature and denaturing agents on the signal shape was explained by the change of orientational freedom of liganded NO associated with the conformational change of globin moiety. (Author abstract modified)

16051

Vodar, Boris

ABSORPTION COEFFICIENTS OF GASES IN THE RANGE FROM 100 A TO 500 A. High Pressure Lab., Bellevue, France, Contract DAJA37-67-C-0388, Final Tech. Rept., Proj. 20014501B11B, 30p., March 31, 1968. 30 refs.

Absorption spectra between 100 and 500 A for NO, CO, CO2, H2O, NH3, CH4 a grazing incidence were obtained with grating spectrograph, a condensed spark as the continuum background, and very thin layers of appropriate materials for cell windows. This region is characterized by continuous absorption rapidly decreasing towards short wavelengths, commonly attributed to photoionization processes. Striking features in the spectra up to higher energy corresponding to ionization of an inner shell electron were not expected. Whenever possible, results near 500 A were compared to results of other authors, and agreement was generally satisfactory. Comparisons were made between absorption curves of similar molecules such as H2O, NH3, and CH4. Except for CH4, it was not possible to relate experimental results to theoretical calculations because no adequate theory of the photoionization of molecules exists. The high symmetry of CH4 permits a calculation on a quasi-atomic basis.

16070

Henriksen, Thorrod

EFFECT OF OXYGEN ON RADIATION-INDUCED FREE RADICALS IN PROTEINS. Radiation Res., 32(4):892-904, 1967. 27 refs.

The effect of oxygen and nitric oxide on radiation-induced free radicals in trypsin was studied by electron spin resonance (ESR)

spectroscopy. Evacuated samples were irradiated with X-rays at room temperature and kept at this temperature for 20 hrs before ESR measurements were begun. The samples were then opened to an atmosphere of oxygen or nitric oxide, and the reactions between the paramagnetic gases and the protein radicals were followed by qualitative and quantitative ESR observations. The reaction with oxygen resulted in a transient ESR signal consisting of a single line with a (g) value of 2.007 and a width of approximately 13 gauss. The line is presumably due to a peroxide radical. The reaction with nitric oxide results in the direct formation on nonradical products. Experiments with nitric oxide and protein particles of different physical dimensions show that the diffusion theory adequately describes the decay of radicals. It was also found that both sulfur and doublet-type radicals react with paramagetic gases. (Author abstract modified)

16097

Adams, G. E. and B. D. Michael

THREE STAGE ELECTRON TRANSFER IN AQUEOUS AND ALCOHOLIC SOLUTIONS. Nature, 215(5107):1248-1250, Sept. 16, 1967. 16 refs.

The use of pulse radiolysis to explore the radiation chemical behavior of compounds of high electron affinity was discussed. The acceptors used were acetone, acetophenone, benzophenone, fluorenone, N-ethylmaleimide, dimethylfumarate, nitrous oxide, and oxygen. Solutions in either triply distilled water or highly purified ethanol were made alkaline with potassium hydroxide and sodium ethoxide respectively. Samples were irradiated with a 0.2 potassium hydroxide and sodium ethoxide respectively. Samples were irridiated with a 0.2 microsecond pulse of 1.8 MeV electrons from a linear accelerator, and the transient changes in optical density were recorded spectrophotometrically. Transient spectra of several deoxygenated, aqueous, alkaline solutions of acetopheone, benzophenone, and acetone were shown. The absorption maximum of 4400 A was assigned to the electron adduct of acetopenone while the peak at 3700 A was caused by the OH adduct. In the presence of high concentrations of acetone, the 3700 peak was suppressed because the precursors, OH radicals, are scavenged by the solute. It was concluded that the 4400 A maximum was due to the electron transfer reaction. A set of similar data for acetone and benzophenone showed the same results. In a system of acetone, acetophenone, benzophenone and potassium hydroxide, acetone must scavenge all hydrated electrons, and therefore the sequential formation of the two ketyl anions indicates the occurrence of a simple three-stage chain electron transfer process. In the presence of oxygen, the radical anions of fluorenone, benzophenone and other acceptors, produced by electron attachment or by chain electron transfer, decay by an exponential process. In all cases, the half times are inversely proportional to oxygen concentration, indicating that reaction takes place. No evidence was found for peroxyanion-radical formation which would favor the mechanism of electron transfer rather than oxygen addition for reaction. In alkaline ethanolic solutions saturated with nitrous oxide, the first order rate constants for electron transfer to fluorenone were proportional to the fluorenone concentration.

16117

Hartkamp, Heinrich

INVESTIGATIONS OF THE STOICHIOMETRY OF THE REACTION BETWEEN GASEOUS NITROGEN DIOXIDE AND THE SALTZMAN REAGENT. (Untersuchungen zur Stoechiometrie der Umsetzung zwischen gasfoermigem Stickstoffdioxid und Saltzman-Reagens). Text in German. Staub, Reinhaltung Luft, 29(11):447-451, Nov. 1969. 9 refs.

From preparative and analytical work and from spectrophotometric investigations, it was determined that the reaction of Saltzman reagent with both nitrogen dioxide and nitrite ions results in the formation of the azo dye, 1-(N-aminoethyl)-amino-4-naphtyl-azobenzene-p-sulfonic acid. This dyestuff, when dissolved in the Saltzman reagent, exhibits a molecular extinction coefficient of 42,150/mole cm at a wavelength of 545 nm. From this constant, the stoichiometric factor governing the reaction between the Saltzman reagent and highly diluted nitrogen dioxide was derived. The stoichiometric factor was 1000 which was in agreement with the findings of Stratman and Buck and in contrast to the value reported by Saltzman. (Author summary modified)

16161

Coltharp, R. N., J. T. Scott, and E. E. Muschlitz, Jr.

MOLECULAR BEAM INVESTIGATIONS OF THE DISSOCIATION OF NITROUS OXIDE ON TUNGSTEN. J. Chem. Phys., 51(11):5180-5181, Dec. 1969. 4 refs.

Experiments were performed using modulated beam techniques, including the use of a lock-in amplifier. By rotating a quadropole mass spectrometer about a tungsten ribbon target, the spatial distributions of both the reflected N2O and the N2 dissociation product were determined. With a beam of N2O incident on the surface, it was found that both nitrogen and nitric oxide could be observed at temperatures above 1800 K. At 2500 K, the ratio of N2 to NO was found to be 12 + or - 2. While the N2O distribution was found to be lobular at high temperatures, both the N2 and NO distributions were found to be diffuse. This was interpreted to mean that these molecules remained on the surface for sufficient lengths of time for thermal equilibrium to be achieved since a lobular distribution would be expected, had the residence times been as short as that observed for the reflected N2O. Attempts to find other products such as oxygen and nitrogen atoms were unsuccessful. To confirm the results, measurements were made of the angular distribution of reflected beams of N2 and NO from the same surface. At 2500 K, sharp lobular patterns were observed, with maxima shifted away from the specular angle toward the normal to the surface in contrast to the diffuse patterns observed for the N2 and NO resulting from the dissociation of N2O. The N2 and NO molecules formed in the dissociation of N2O on tungsten originate from N2O molecules that remained on the surface

for times which are long compared with the vibrational period of the surface atoms, but short compared with the beam-modulation period. On the other hand, the lobular distributions observed for the reflected N2O, N2, and NO molecules indicated that these molecules remained on the surface for a period short compared with the vibrational period of the surface atoms. The results were consistent with the expected prediction that a sticky collision of the N2O molecule is required for dissociation to occur.

16167

Kul'kova, N. V., N. N. Savodnik, D. M. Dokholov, M. S. Furman, and M. I. Temkin

CATALYTIC ACTIVITY OF PLATINUM IN THE HYDROGENATION OF NITRIC OXIDE. Kinetics Catalysis (USSR) (English translation from Russian of: Kinetika i Kataliz), 10(3):570-571, May-June 1969. 8 refs.

Platinum catalysts were prepared and investigated on various acid-resistant carriers: the activated charcoals AR-3, AG-2, and SKT; aluminosilicate in the form of microspheres; and fine-grained corundum. The catalysts contained 1-10% by weight platinum. The specific surface of the carriers and catalysts was determined according to the low-temperature adsorption of krypton and nitrogen. Measurements of the chemisorption of hydrogen were used to determine the surface of platinum on the carrier. The catalytic activity of the previously investigated catalysts in the hydrogenation of nitric oxide was determined in a flow type set-up. Under the experimental conditions, the rate of formation of hydroxylamine did not depend on the grain size of the catalyst and rate of mixing of the solution. This showed that the reaction did not take place in the kinetic region. After definite periods of time, samples of the solution from hydrogenation were collected for analysis. The content of hydroxylamine and hydrazine hydrochlorides and ammonium chloride was determined. The analyses of the solutions indicated that the process of hydrogenation of nitric oxide to hydroxylamine proceeds selectively; only traces of ammonium chloride were detected. It was concluded that the catalytic activity of a unit surface of platinum on the carriers is only slightly lower than the corresponding value for platinum black and is practically independent of the nature of the carrier.

16195

Manvelyan, M. G., G. O. Grigoryan, S. A. Gazaryan, G. S. Papyan, S. S. Karakhanyan, and L. S. Melik-Ispaelyan

SIMULTANEOUS ABSORPTION OF LOW CONCENTRATIONS OF SULFUR DIOXIDE AND NITROGEN-CONTAINING GASES BY ALKALIES AND CARBONATES. COMMUNICATION 6. EFFECT OF INHIBITORS ON THE OXIDATION OF CALCIUM SULFITE TO SULFATE BY OXYGEN OF THE AIR IN THE PRESENCE OF TRACES OF NITROGEN OXIDES. (Sovmestnoe ulavlivanie

PHOTOCHEMICAL OXIDANTS AND AIR POLLUTION

nizkokontsentrirovannykh sernistykh i nitroznykh gazov shchelochami i karbonatami. Soobshchenie VI. Vliyanie ingibitorov na protsess okisleniya sul'fita kal'tsiya v sul'fat kislorodom vozdukha v prisutstvii sledov okislov azota). Text in Russian. Izv. Akad. Nauk Arm. SSR Khim. Nauk, (14(1):27-33, 1961. 2 refs.

It was confirmed that paraamino phenol, paraphenylene diamine, furfural, hydroquinone and glycerol are strong inhibitors of oxidation of sulfites to sulfates by oxygen in the air. Phenol had a weak inhibitory effect. When calcium sulfite was oxidized in air in the presence of traces of nitrogen oxides (the inhibitor being present in the amount of 0.5% of the weight of the sulfite), paraamino phenol and glycerol had no inhibitory effect on the reaction, while paraphenylenediamine, hydroquinone, and furfural inhibited it only slightly. An increase in the concentration of the inhibitor to 1% led to an increase in the oxidation of calcium sulfite to sulfate; further increase in inhibitor concentration had only a slight effect on the degree of oxidation. With a combined flow of the gas mixture, the inhibitory effect was more marked.

16204

Manvelyan, M. G., G. O. Prigoryan, and S. A. Gazaryan

JOINT RECOVERY OF LOW CONCENTRATIONS OF SULFUR DIOXIDE AND NITROGEN-CONTAINING GASES BY ALKALIS AND CARBONATES. COMMUNICATION I. (Sovmestnoe ulavlivanie nizkokontsentrirovannykh sernistykh i nitroznykh gazov shchelochami i karbonatami). Text in Russian. Izv. Akad. Nauk Arm. SSR Khim. Nauk, 12(3):166-174, 1959. 16 refs.

Oxidation of sulfite to sulfate by a mixture of gases was studied experimentally as a preliminary step in the eventual development of a process for recovery of waste gases in industrial processes. The gas mixture used was a combination of nitric oxide, nitrogen dioxide, nitrogen, and oxygen. The oxides of nitrogen apparently acted as initiators in the process of converting sulfite to sulfate. The more soluble sulfites (i.e., ammonium and sodium sulfites) were more readily oxidized than calcium and barium sulfites.

16207

Schiemann G., F. Fetting, G. Prauser, and F. Steinbach

HETEROGENEOUS REACTIONS IN A FREE FALL REACTOR. (Heterogene Reaktionen in einem Rieselwolkenreaktor). Text in German. Inst. Chem. Engrs. Symp. Ser., no. 27:153-160, 1968. 12 refs.

The reaction mechanism in a free fall reactor was studied and compared with the ideal flow tube and the ideal agitator vessel. The hydrogenation of ethylene and the oxidation of carbon monoxide on grained Pd-containing catalysts were used as model reactions. The kinetic data of these reactions were determined in a fixed-bed

reactor connected in parallel to the free fall reactor. The speed of the hydrogenation process was determined by the substance transport, that of oxidation by the chemical reaction speed. To interpret measurements of the amount of substance converted, mixing processes were studied using a dispersion model. The Bodenstein numbers obtained from the measured mixing coefficients were used to calculate the quantity converted. The measured values agreed well with the calculated values.

16209

Manvelyan, M. G., G. O. Grigoryan, S. A. Gazaryan, G. S. Papyan, and R. L. Mirumyan

SIMULTANEOUS COLLECTION OF IOW-CONCENTRATION SULFUR DIOXIDE AND NITROGEN OXIDE GASES WITH ALKALIES AND CARBONATES. PART III. OBTAINING GYPSUM IN A LARGE-SCALE LABORATORY ARRANGEMENT. (Sovmestnoye ulavlivaniye nizkokontsentrirovannykh sernistykh i nitroenykh gazov shchelochami i karbonatami. Soobshcheniye III. Izucheniye protsessa polucheniya gilsa na ukrupnennoy laboratornoy ustanovke). Text in Russian. Izv. Akad. Nauk Arm. SSR Khim. Nauk, 12(5):313-323, 1959. 3 refs.

The production of gypsum by simultaneous absorption of low-concentration sulfur dioxide and nitrogen oxide gases with carbonates was studied using large-scale laboratory equipment. It was established that 100% gypsum can be obtained with SO2 concentrations up to 1.5% and nitrogen oxide concentrations from C.05 to 0.1%. When the solid-to-liquid phase ratio was increased from 1:100 to 1:20, no reduction in intensity of the process was detected, nor did the degree of converstion of SO3 to SO4 decrease. Similar results were obtained when the gas flow rate was reduced. When a calcium carbonate suspension was replaced with calcium hydroxide, the process rate was reduced by only 10-20%. The use of limestone both in the form of a suspension and in the form of chunks in a water irrigation apparatus also leads to the formation of 100% gypsum, the reaction rate being somewhat lower in the latter case. The possibility of utilizing a circulating liquid was demonstrated. Introduction of the gas mixture at several points was shown to significantly increase the reaction rate. Chemical, thermal, and x-ray analyses showed the gypsum formed in these experiments to be identical with medicinal gypsum.

16218

Buff, H. and A. W. Hofmann

DISSOCIATION OF GASEOUS COMPOUNDS BY ELECTRICALLY INDUCED GLOWING. (Zerlegung gasformiger Verbindungen durch electrisches Gluehen). Text in German. Ann. Chem. Pharm., 113(2):129-150, 186C. 4 refs.

Gases and vapors of liquids with low boiling points were exposed

to powerful sparking as produced by the Ruhmkoff induction coil, to glowing platinum and iron wires, and to the high temperature of the flame arc, and the dissociation was observed. The induction coil is best suited for dissociation of ammonia; all the other methods take too long. Dissociation of C2H5N begins immediately, but it is never complete. Dissociation of C6H9N and of C4H7N is slow and incomplete. Iron wires dissociated C2N completely but slowly; the flame arc is much faster. The induction coil is least suitable. Nitric oxide is dissociated rapidly by a glowing iron spiral and by the flame arc, and slowly by the induction coil. The dissociation is not complete. Similar results are obtained with NO2. None of the methods work with dry CO. Reduction of CO2 is slow with both the flame arc and the induction coil. The dissociation of CS2, C2H4, C4H4, SO2, HS, PH3, ClH and SiFl2 was observed in like manner, and the efficiency of each method was stated.

16235

Woolum, John C., Enzo Tiezzi, and Barry Commoner

ELECTRON SPIN RESONANCE OF IRON-NITRIC OXIDE COMPLEXES WITH AMINO ACIDS, PEPTIDES AND PROTEINS. Biochim. Biophys. Acta (Amsterdam), 160(3):311-320, 1968. 16 refs.

Ferrous iron-nitric oxide complexes with amino acids, peptides, and proteins were prepared for electron spin resonance studies by dissolving the latter in water and ascorbic acid. The pH was adjusted to 6 and NaOH or HCl and NaNO3 were added to the complexes. Signals were recorded by a spectrometer specifically designed for high sensitivity for aqueous samples. A free radical with a (g) value of 2.033 and line width of about 8 gauss was present in all reaction mixtures. Three line hyperfine resonances due to a chelate type complex and a 13 line hyperfine resonance were also observed. These hyperfine structures can be used to determine the structure of complexes made with amino acids and short peptides. The unimpaired electron of the free radical complexes formed by amino acids, iron and NO is associated to some degree with nitrogen atoms. Though amino protons do not contribute to resonance spectra, signals from iron-NO complexes formed by protein depend on the amino acid composition of the protein. If the protein is poor in SH groups, the iron-free radical complex is associated with imidazole groups in protein histidine residues. If the protein is rich in SH groups, the iron-NO free radical is formed with the SJ groups. These iron-NO protein complexes have signals similar to cysteine complexes in the frozen state. If a complex has excess iron and protein containing both imidazole and accessible SH groups, both types of signals are produced. Iron-NO free radical complexes have significant biological implications. They appear in organisms exposed to both nitrite and NO and can influence the enzymatic properties of a number of proteins.

16236

Ludwig, Barbara E. and G. R. McMillan

DISPROPORTIONATION AND COMBINATION REACTIONS OF ISOPROPOXY

RADICALS WITH NITRIC OXIDE. J. Phys. Chem., 71(3):762-764, Feb. 1967. 5 refs.

Because the disproportionation:combination ratio of ethoxy radicals with nitric oxide is important in the photochemistry of alkyl nitrites, nitrates, and nitro compounds, isopropoxy-nitric oxide reactions were studied by pyrolyzing diisopropyl and nitric oxide mixtures at 25 to 180 deg. As determined by gas chromatography, the main reaction products were isopropyl nitrite, acetone, and isopropyl alcohol. Traces of acetaldehyde and methyl nitrate were also present. Over the ranges indicated, the following variables had no effect on the acetone: isopropyl nitrite ratio: diisopropyl peroxide pressure, 2.7-14.6 mm; nitric oxide pressure, 2.8-46.9 mm; nitric oxide pressure: peroxide pressure, 0.35-8.58 mm; percent peroxide decomposition, 2.0-12.1%; reaction time, 0.7-14440 min; and added nitrogen, 200 mm. Below 150 deg, product ratios were temperature dependent due to surface reactions. Above 160 deg, the isopropyl nitrite ratio is temperature independent. This constancy together with independence of the ratio of the other variables suggests that the disproportionation:combination ratio is 0.17 at 26 to 180 deg. Like alkyl-alkyl reactions, isopropoxy-nitric oxide reactions show appreciable difference in activation energies for disproportionation and combination processes.

16258

Askar'yan, G. A.

EXCITATION AND DISSOCIATION OF MOLECULES IN AN INTENSE LIGHT FIELD. Soviet Phys. JETP (English translation from Russian of: Zh. Eksperim. i Teor. Fiz.), 19(1):273-274, Jan. 1964. 2 refs.

The possibility and conditions for the direct dissociation of molecules in a very intense light field were discussed. The magnitude of the effect was estimated by means of simple quasiclassical calculations. In homopolar molecules, the difference between the nonresonance and resonance interactions as a function of the mutual positions of the interacting atoms and the direction of the electric vector of the light wave were noted. At the same values of the various quantities involved, the dissociation of heteropolar and ionic systems was more intense. The strongest dissociation effect appeared when the atoms lay along the direction of the electric field. For the dissociation of homopolar molecular ions, light fields of higher frequencies were used, modulated or rotating at a frequency close to the vibration resonance. It was concluded that it is possible to use an intense light field with resonance carrier or modulation frequencies for effective excitation and dissociation. The effects considered may be used to intensify the effect of light on molecular media or on micro-objects in order to dissociate beams on fast atoms or ions entering a trap thus obtaining an atomic beam from a molecular beam, or to directly heat the molecules of a medium.

16261

Knott, Marta J. and Myron Malanchuk

ANALYSIS OF FOREIGN AEROSOL PRODUCED IN NO2 RICH ATMOSPHERES OF ANIMAL EXPOSURE CHAMBERS. Am. Ind. Hyg. Assoc. J., 30(2):147-152, March-April 1969. 4 refs.

In an earlier toxicological study, monitoring of a chamber in which dogs were exposed to NO2 and ferric oxide indicated the presence of an extraneous aerosol with twice the response of the Fe2O3 aerosol concentration used. The present study was initiated to identify the substance and measure its components. Nitrate, nitrite, and ammonium analyses were performed on water-soluble portions of aersol samples withdrawn from the chamber, both when dogs were present and absent. Analyses revealed that no nitrite salts wery present, but that nitrate and ammonium ions were present in appreciable quantities. The relationship between the nitrate and ammonium ions was examined. In every set of samples, the NO3-N content was greater than the NH4-N content, indicating that the foreign aerosol is primarily NH4NO3. Nitrogen dioxide concentrations and dog activity contributed to but did not determine NH4(+) or NO3(-) contents of the samples.

16276

Ganz, S. N. and I. E. Kuznetsov

THE DESIGN OF OPEN EQUAL-FLOW TOWERS WITH CENTRIFUGAL SPRAYERS. Intern. Chem. Eng., 5(4):653-656, Oct. 1965. 7 refs. (Also: Izv. Vysshikh Uchebn. Zavedenii Khim. i Khim. Teckhnol., 8(1):151, 1965).

Open towers with uniform gas velocities and bulk spraying of liquids are finding increasing application in heat- and mass-transfer processes. A general method of designing open spray towers with centrifugal spraying is proposed, and equations are derived for computing power consumption, average drop diameter, and absorption coefficients for nitric oxide, hydrogen sulfide, and sulfur dioxide in Na2CO3 solution. The design techniques presented make possible the accurate determination of basic structural shapes and sizes of equipment. Spray densities of open spray equipment for various volumetric gas velocities are tabulated.

16296

Pickert, Hans and Carl Wagner

A STUDY OF THE KINETICS OF SILVER SULFIDATION. II. THE INFLUENCE OF THE PENETRATION REACTION OF THE SILVER THROUGH THE PHASE BOUNDARY SILVER/SILVER SULFIDE. (Zur Kinetik der Sulfidierung von Silber. II. Der Einfluss der Durchtrittsreaktion des Silbers durch die Phasengrenze Silber/Silbersulfid). Text in German. Z. Physik. Chem. Neue Folge (Frankfurt), vol. 31:32-39, 1962.

The speed with which one-dimensional, compact silver sulfide layers develop during a reaction between silver and liquid sulfur was determined at 200 and 300 C by using the penetration reaction of silver through the phase boundary Ag/Ag2S and the movement of silver ions and electrons in Ag2S. The rate of Ag2S formation was computed up to very thick layers (5 cm) from the laws governing the three individual processes, such as (1) penetration of silver ions and electrons through the phase boundary Ag/Ag2S, (2) movement of silver ions and electrons through the compact Ag2S, and (3) inclusion of sulfur in the Ag2S lattice at the phase boundary Ag2S/S. The results agreed well with measurements conducted earlier. The linear time law for very thin layers (less than 0.1 cm) may be quantitatively expressed by assuming that the transition of the silver from the metallic state to Ag2S is the rate-determining process.

16307

Collier, Susan S., Akira Morikawa, David H. Slater, Jack G. Calvert, George Reinhardt, and Edward Damon

THE LIFETIME AND QUENCHING RATE CONSTANT FOR THE LOWEST TRIPLET STATE OF SULFUR DIOXIDE. J. Am. Chem. Soc., 92(1):217-218, Jan. 1970. 5 refs.

The lifetime of a sulfur dioxide triplet species which was generated in two distinct photochemical ways was determined. The first method was direct laser light excitation of sulfur dioxide to the first excited triplet state by absorption at 3828.8 A within the forbidden triplet - singlet band in the pressure range 1-25 Torr. Excitation occurred only in the reaction SO2 + light (3828.8 A) yields the first excited triplet state of SO2. Triplet decay was seen in the reactions: first excited triplet state yields SO2 + light or SO2, and first excited triplet state yields SO3 + SO or 2SO2. The second method employed was flash photolytic excitation of sulfur dioxide to the first excited singlet state with subsequent triplet population by intersystem crossing at pressures of 0.02-0.15 Torr. Excitation of sulfur dioxide occurred in the reaction SO2 + light (2500-3300 A) yields the first excited singlet state. Triplet formation, and excited singlet and triplet molecule decay, resulted from a series of reactions: first excited triplet state yields SO2 + light or SO2; first excited triplet state + SO2 yields SO3 + SO or 2SO2; the first excited singlet state + SO2 yields 2SO2 or the first excited triplet state + SO2; and the first excited singlet state yields SO2 + light or SO2 or the first excited triplet state. It was concluded from the graphs of inverse triplet lifetime vs. sulfur dioxide pressure that the triplet lifetime is a marked function of the sulfur dioxide pressure. The reactivity of the triplet toward SO2 is not a strong function of the vibrational level in which the triplet is first formed. Vibrational equilibration of the triplet is practically complete for all of the conditions employed. These results are in opposition to those presented by Caton and Duncan who showed no dependence of sulfur dioxide pressure.

16315

Moskalenko, N. I.

SPECTRAL TRANSMISSION FUNCTIONS IN BANDS OF H2O VAPOR, O3, N2O AND THE N2 COMPONENT IN THE ATMOSPHERE. (Funktsii spektral'nogo propuskaniya v polosakh parov H2O, O3, N2O and N2 komponent v atmosfere). Text in Russian. Fiz. Atm. i Okeana (Moscow), 5(11):1179-1190, 1969. 17 refs.

The spectral transmission functions of water vapor, ozone, nitrous oxide, and nitrogen were obtained in the infrared region. The presence of absorption bands of the N2 component was shown in the spectral region 3.85-4.3 micron and parameters are given which permit the calculation of its absorption in the atmosphere.

16375

Moruzzi, J. L. and A. V. Phelps

SURVEY OF NEGATIVE-ION-MOLECULE REACTIONS IN O2, CO2, H2O, CO, AND MIXTURES OF THESE GASES AT HIGH PRESSURES. J. Chem. Phys., 45(12):4617-4627, Dec. 15, 1966. 38 refs.

Negative ions formed in high-pressure drift tubes were analyzed by mass spectrometric techniques for various pressures and various ratios of electric field strength to pressure (E/p). Gases studied include O2, CO2, H2O, and CO plus the mixtures CO2-O2, H2O-O2, and CO-O2. Results were presented in the form of plots of the relative negative ion currents as a function of E/p at fixed pressure or as a function of the partial pressure of an added gas, and as plots of the ratios of negative ion currents as a function of pressure at fixed E/p for the various gases and mixtures. The measurements were interpreted in terms of the following reactions between the negative ions and gas molecules: dissociative attachment, three-body attachment, ionization, collisional detachment, two-body conversion, and three-body conversion. A significant finding was the observation of apparent associative-detachment reactions involving O(-) and either CO or H2. This type of reaction is of interest because of the possibility that O2(-) and O(-) ions present in the atmosphere are destroyed by associative detachment in collisions with atomic oxygen. An attempt is being made to measure the rate coefficients for these reactions.

16379

Chertkov, B. A.

THEORY OF OXIDATION OF SULFITE-BISULFITE SOLUTIONS. (K teorii okisleniya sul'fit-bisul'fitnykh rastvorov). Text in Russian. Zh. Prikl. Khim., 32(12):2609-2613, 1959. 9 refs.

The deviation from a theory of oxidation of sulfite-bisulfite solutions with impurities (thicsulfate and trithionate in particular) under industrial conditions was examined. The oxidation rate increased significantly with even a slight thionate content. An explanation of the catalytic role of thiosulfate in the overall mechanism of oxidation of sulfite-bisulfite solutions was given and was based on earlier research by the same author on the oxidation of ammonium sulfite-bisulfite.

16391

Bullrich, K., R. Eiden, G. Eschelbach, K. Fischer, G. Haenel, K. Heger, H. Schollmayer, and G. Steinhorst

COMPUTATION OF MULTIPLE SCATTERING IN THE TURBID ATMOSPHERE. In: Research on Atmospheric Optical Radiation Transmission. Dec. 1, 1967 - Nov. 30, 1968. (Final Report.) Johannes Gutenberg-Universitaet, Mainz, Germany, Inst. fuer Meteorologie, OAR Contract F 61052 67 C 0046, AFCRL-69-0-0266, p. 54-81,108-111, Jan. 1969. 38 refs.

A method is given for the approximate calculation of multiple scattering in the turbid atmosphere using the equation of radioactive transfer, the atmosphere being divided in different layers of certain optical depths. Because of the large computer memory required for the solution of the matrix equation, the single step method of Gauss-Seidel is used in combination with the Jacobi iteration procedure. To obtain exact results of the intensities, it is necessary to solve the radiative transfer equation for all four Stokes' parameters. (Author abstract modified)

16419

Pozin, M. Ye., Y. P. Mukhlenov, and L. S. Vasilesku

OXIDATION OF SULFUR DIOXIDE IN IRON SULFATE SOLUTION. (Ob Okislenii sernistogo angidrida v rastvore sul'fatov zheleza). Text in Russian. Zh. Prikl. Khim., 28(7):681-686, 1955. 7 refs.

The oxidation of SO2 in the presence of iron ion was studied experimentally. The following optimum conditions were established for simultaneous processing of waste gases and pickling solutions: 1) during oxidation of FeSO4 to Fe2(SO4)3 - temperature from 60-80 C, incoming SO2:O2 ratio of 1:5, an initial concentration of ferrous sulfate up to 18% does not affect the course of the reaction; 2) during sulfuric acid formation - temperature from 80-90 C, SO2:O2 ratio equal to 1:4, optimum iron ion concentration, 10-30 g/liter. An acid formation rate of about 1000 kg of sulfuric acid monohydrate from a cubic meter of reaction volume was achieved in the laboratory under optimum conditions. These experiments demonstrate the advisability of examining the reaction of SO2 exhaust gas with spent pickling solutions under plant conditions for the purpose of recovering the pickling solutions or for producing dilute sulfuric acid and crystalline ferric sulfate.

16422

Zalogin, N. and N. Nechaeva

THE POSSIBLE EFFECT OF WAVELENGTH OF THE HIGH-FREQUENCY DISCHARGE ON GASEOUS CHEMICAL REACTIONS. (O vozmoshnom vliyanii dliny volny vysoko-chastotnogo razyada na gazovye khimicheskie reaktsii). Text in Russian. Zh. Fiz. Khim., 6:436-44, 1935. 8 refs.

The effect was studied of wavelength on the oxidation reaction of sulfur dioxide and on the value of the logarithmic attenuation ratio in a mixture of sulfur dioxide and air. A relationship was found to exist between the logarithmic attenuation ratio and the ongoing chemical reaction. The effect was studied of the wavelength on the oxidation of sulfur dioxide in an atmosphere of pure oxygen and on the value of the logarithmic attenuation ratio in a mixture of sulfur dioxide and oxygen. This relationship differed from that obtained for oxidation of sulfur dioxide in the air. The effect was studied of wavelength on the formation of ozone in an atmosphere of oxygen and on the logarithmic attenuation ratio. An increase in the wavelength from 150 to 500 meters decreased the yield of ozone. A curve was drawn for the effect of the frequency of the high-frequency discharge on the value of the ratio in an atmosphere of nitrogen. The maximum logarithmic attenuation ratio occurred at 220 meters. The relationship was studied of the amount of nitrogen oxides formed, in a mixture of nitrogen and oxygen, on the percentage content of these gases. The optimal ratio of the reacting gases depended on the frequency of the high-frequency discharge.

16429

Kornfeld, G. and E. Weegmann

THE OXIDATION OF SULFUR DIOXIDE IN ULTRAVIOLET LIGHT. (Die Oxydation von Schwefeldioxyd im ultravioletten Licht). Text in German. Z. Elektrochem., 36(9):789-94, 1930. 13 refs.

Sulfur dioxide obtained by dropping concentrated H_2SO_4 into $NaHSO_3$ was mixed with electrolytically produced oxygen and irradiated with 3130, 3020 to 2970, 2800, 2537, 2300 to 2140, 2070 and 1860 A. The SO_2 content was determined by iodometric titration and compared with the SO_2 content of a nonirradiated sample. The UV-absorption of SO_2 was so complete that the fraction of light which penetrated the layer was negligible. Despite this, however, no reaction was observed at 3020, 2800, or 2537 A. Indication of SO_3 formation were obtained only in the shortwave range experiments. It was found that SO_3 also absorbed ultraviolet light, which led to its dissociation. For one and the same wavelength, the number of molecules converted per quantum depended on the concentration of the formed SO_3. The absorption was more pronounced at 1860 than 2070 A. The reaction speed was independent of the SO_2 and O_2 concentration. Dissociation of pure SO_2, which lead to the formation of SO_3 and precipitation of S_2, took place at 2070 and 1860 A, but not at 2537 A. No explanation is found for this phenomenon. Further analyses are required.

16461

Boreskov, G. K. and T. I. Sokolova

KINETICS OF CONTACT OXIDATION OF SULFUR DIOXIDE ON FERRIC OXIDE. (Kinetika kontaktnogo okisleniya sernistogo gaza no okisi zheleza). Text in Russian. Zh. Fiz. Khim., 18(3-4):87-101, 1944. 19 refs.

The effect of temperature on the rate of catalytic oxidation of SO2 on ferric oxide and on the change in catalyst composition was studied experimentally. It was established that a sharp decrease in catalytic activity observed at 620-640 C is conditioned by conversion of ferric oxide (hematite) to catalytically inactive ferric sulfate. Ferrous-ferric and ferrous sulfates were not detected in the catalyst after low temperature operation. The kinetics of SO2 oxidation over Fe2O3 were studied at 680 C. Above 625 C (i.e., above the range of hematite stability), the apparent activation energy of the forward reaction is 38,000 cal. A proposed mechanism for Fe2O3 catalysis of SO2 which assumes an intermediate reaction of SO2 with the surface of the catalyst, without disruption of the bond between surface iron atoms and the rest of the hematite crystal lattice, is presented. It is suggested that the surface of the hematite crystals combines with oxygen and that the limiting stage of the catalytic reaction is the absorption of oxygen from the gaseous phase.

16462

Adadurov, I. Ye., D. V. Gernet, and A. V. Shuryayeva

EFFECT OF CARRIERS AND DILUENTS ON ACTIVATION ENERGY AND DISPERSION COEFFICIENT. (Vliyaniye nositeley i razbaviteley na energiyu aktivatsii i velichinu koefetsienta rasseyaniya). Text in Russian. Zh. Fiz. Khim, 7(3):451-464, 1936. 13 refs.

Studies of catalytic reactions involving a chromium-tin catalyst demonstrated that: 1) as the applied catalyst layer is increased, the distorting effect of the substrate is reduced; 2) the distorting effect of the substrate is greater the smaller the radius of its cation and the greater its charge; 3) disruption of catalytic action is greater the greater the radius of its cation and the smaller its charge. Experimental data relate to oxidation of SO2 to SO3. The catalyst was tested on porcelain, Al2O3, Fe2O3, Al2O3, and MnO2 substrates. Catalyst diluents used were calcium sulfate, strontium sulfate, barium sulfate, thoric oxide, ceric oxide, and zirconium dioxide. Rate constants, temperatures, and activation energies for maximum conversion are tabulated for various catalyst combinations. An exponential dependence of the coefficient of activity on activation energy is revealed, the dispersion coefficient depending on the method of preparation of the catalyst and hence on the kinetic conditions of formation of active centers.

16463

Kashtanov, I. I. and V. P. Ryzhov

INVESTIGATION OF THE OXIDATION KINETICS OF GASEOUS SULFUR DIOXIDE IN WATER SOLUTIONS AND THE PROCESSES OF CONTAMINATION OF MANGANESE SULFATE WITH PHENOL. (Izucheniye kinetiki okisleniya gazcobrasnogo sernistogo angidrida v vodnykh rastvorakh i protsessov otravleniya sernokislogo margantsa fenolom). Text in Russian. Izv. Teplotekhn. Inst., 1939:37-40. 7 refs.

Oxidation of SO2 in water solutions was studied experimentally to determine the effect of phenol both with and without MnSO4 catalyst. The following conclusions were reached. Oxidation processes taking place during absorption of SO2 by a solution are analogous to those for oxidation of solutions of sulfuric acid. The percent of oxidation decreases as the total quantity of gas passing through the adsorbing liquid is increased. The percent of desorption increases as the total gas flow rate through the absorber increases. The percent desorption increases as SO2 concentration of the solution increases. Manganese sulfate salts increase oxidation rate twofold. The presence of phenol in the solution retards autooxidation of SO2, the percent oxidation decreasing with increased phenol concentration. Phenol in amounts of 0.1% completely eliminates catalytic action. Trace amounts of phenol sharply decrease the rate of autooxidation both with and without catalyst. Increasing the phenol concentration above 0.1% has practically no further effect. Oxidation of SO2 takes place not only in solution, but also at the surface of the solvent.

16488

Cantwell, Allan M. and Donald J. Morton

A SIMPLIFIED ENVIRONMENTALLY-CONTROLLED PLANT FUMIGATION CHAMBER EMPLOYING DYNAMIC EQUILIBRIUM PRINCIPLES. Preprint, Delaware Univ. Newark, Dept. of Plant Pathology, 5p., 1966 (?). 2 refs.

A simple fumigation chamber based on dynamic-equilibrium principles effectively controls temperature, relative humidity, and pollutant levels in plant fumigation studies. A 30-cu ft growth chamber capable of controlling temperature and day length was modified to control relative humidity by means of a spray nozzle and humidistat. A high pressure blower was installed in an inlet duct followed in sequence by a set of activated charcoal filters, an inlet to introduce a gaseous oxidizing agent to neutralize reductants not removed by the first filters, and a second set of filters. Conditioned air in the growth chamber is mixed with a gaseous pollutant, passed through a turbulence-inducing diffusion plate and distribution tube to the fumigation chamber, and is finally vented to the atmosphere. The system has a high degree of reliability and needs little attention after stabilization, which requires two hours. After this initial period, substantial changes in pollutant concentrations can be stabilized within 10 to 15 minutes. The fumigation chamber was

used to determine the effect of temperature on tobacco plants exposed to 10 and 20 pphm ozone. Results show that ozone damage in sensitive plants is inversely related to temperature, and not to humidity, which was maintained at a constant 80%.

16509

Sosnovsky, H. M. C.

THE CATALYTIC ACTIVITY OF SILVER CRYSTALS OF VARIOUS ORIENTATIONS AFTER BOMBARDMENT WITH POSITIVE IONS. Phys. Chem. Solids, vol. 10:304-310, 1959. 15 refs.

Single crystals of silver with surfaces oriented parallel to (111), (110), and (100) were bombarded with positive argon ions at voltages between 14 and 4000 V. The catalytic decomposition of formic acid was used as a test reaction in the temperature range 150-250 C. For each of the crystals, the catalytic activity was measured as a function of the energy of the bombarding ions. The parameters, log A (frequency factor) and E (experimental activation energy) found from Arrhenius plots, change considerably with bombarding ion energy and are different for each ion energy for the three orientations. It was concluded that the reaction occurs at sites where dislocation lines intersect the surface and that a compensating effect occurs which is associated with interaction between dislocations when their density is high. (Author abstract modified)

16530

Rai Dastidar, T. K., P. K. Bhattacharyya, and A. K. Barua

HEAT CONDUCTIVITY OF THE SLOWLY DISSOCIATING SYSTEM 2NO2 IN EQUILIBRIUM WITH 2NO + O2 FROM 200 TO 400 C. Trans. Faraday Soc., 65(563):2913-2917, Nov. 1969. 12 refs.

The thermal conductivity of the slowly dissociating system 2NO2 in equilibrium with 2NO + O2 was measured at 200-400 C and at various pressures by the hot-wire technique. On comparing the experimental data with theories of heat transfer in reacting gases, it was found that the effect of chemical reaction on heat conductivity is apparent at 350 C and above, but negligible at 300 C and below. Theories regarding the role of chemical enthalpy at high temperatures are inadequate for a quantitative explanation of the experimental results. (Author abstract modified)

16569

Streetman, J. R. and F. A. Matsen

A FLOW REACTOR FOR KINETIC STUDIES. Texas Univ., Austin, Dept. of Chemistry, Contract AF 18(600)-430, TN-18, OSR-TN-55-125, 15p., May 1955.
DDC AD 63363

A new flow reactor was constructed for the study of the kinetics of thermal reactions in acetylene and oxy-acetylene, particularly those with low oxygen concentrations. The purpose of the reactor was to obtain kinetic data such as specific reaction rate constants, reaction orders, and apparent activation energies from a flow system. The reactor consists of a Vycor tube 214 cm long and having a bore of 1.3 cm. This choice was made so that essentially one-dimensional kinetics will prevail and the relatively simple one-dimensional equations will apply. The tube is electrically heated and the temperature automatically controlled and recorded. The flow of gases is measured by rotameters used individually and in combination. Continuous analysis is carried out on the product gases by an infrared spectrometer. Facilities were provided to permit dilution by helium, inhibition by nitric oxide, and activation by oxygen or ethylene oxide. A detailed description of the apparatus is given.

16574

Strohmeier, Walter and Johann Friedrich Guttenberger

SULFUR-CONTAINING COMPOUNDS AS LIGANDS IN PHOTOCHEMICALLY PRODUCED DERIVATIVES OF THE CYCLOPENTADIENYL MANGANESE TRICARBONYL. (S-Haltige Verbindungen als Liganden in photochemisch hergestellten Derivaten des Cyclopentadienylmangantricarbonyls). Text in German. Chem. Ber., 97(7):1871-1876, 1964. 16 refs.

Cyclopentadienyl manganese tricarbonyl reacts photochemically with the donators D (D equals alkylsulfide, sulfoxide, sulfite, and sulfur dioxide) where CO is split off and the monosubstitutes C5H5Mn(CO)2D are formed. The manganese and donator D are bound by the sulfur. The possibility that they are bound by the oxygen has been ruled out for the following reasons: it has not yet been possible to isolate derivatives of C5H5Mn(CO)3 with O-bases; the frequency of the CO spectra of the studied sulfur complexes is in the range of those donators which are capable of forming electron acceptors; binding by the O-atom would shift the double bond SO frequency toward smaller wave numbers; and sulfones which have no free electron pair form no derivatives with C5H5Mn(CO)3. The tendency of the sulfur to form electron acceptors increases in the order R2S, (CH3)2SO, (CH2)4SO, (C6H5)2SO, (CH22O)2SO, and SO2.

16605

Asinger, Friedrich

THE PRODUCTS OF THE COMMON INFLUENCE OF SULFUR DIOXIDE AND CHLORINE ON ALIPHATIC HYDROCARBONS IN ULTRAVIOLET LIGHT. IV PART: THE PRODUCTS OF THE COMMON INFLUENCE OF SULFUR DIOXIDE AND CHLORINE ON N-DODECANE. (Zur Kenntnis der Produckte der gemeinsamen Einwirkung von Schwefeldioxyd und Chlor auf aliphatische Kohlenwasserstoffe im ultravioletten Licht, IV. Mitt.: Die Produkte der gemeinsamen Einwirkung von Schwefeldioxyd und Chlor auf n-Dodecan). Text in German. Chem. Ber., 77-79(3-4):191-194, 1944. 13 refs.

In a study of the reactions of high molecular straight-chained paraffines hydrocarbons to sulfochlorination, n-dodecane was subjected to a partial sulfochlorination to avoid excessive di and polysulfochloride formation. The sulfochlorides were liberated from the unconverted hydrocarbon through selective extraction with liquid SO2. Di and polysulfochlorides were precipitated from mixtures with monosulfochlorides with pentane. The mixture of monosulfochlorides was then desulfurized, leaving a mixture of dodecyl chlorides in which the chlorine assumed the same position as previously held by the sulfochloride group. The dodecyl chloride mixture was converted into dodecylenes with silver stereate. From 100 g of dodecylene mixture 87g water-insoluble fatty acids were obtained. The composition of the individual acids in mol percent was: C6 17.2, C7 18.6, C8 16.6, C9 19.2, C10 18.1 and C11 10.3.

16609

Overberger, C. G. and J. A. Moore

COPOLYMERISATION OF BENZYL VINYL SULPHIDE WITH SULPHUR DIOXIDE. Chem. Ind. (London), no. 1:24, Jan. 6, 1968. 10 refs.

During studies of the oxidation of polyfunctional mercaptans, a sulfur-containing monomer which could be readily homopolymerized and subsequently converted to poly(vinyl mercaptan) was sought. Benzyl vinyl sulfide (BVS) was investigated. When BVS was injected in liquid sulfur dioxide at -20 to -30 deg in the presence of dry air, a bright, yellow color was formed immediately and persisted until the end of the reaction. Evaporation of unreacted sulfur dioxide at atmospheric pressure and room temperature yielded a thick, yellow mass which dissolved in chloroform to give a yellow solution. The yellow color disappeared and a white solid was precipitated upon addition of this solution to methanol. The dried product was found to be a 1:1 copolymer of SO2 and BVS, and not a homopolymer of BVS as previously reported. When the experiment was performed in the absence of air, no yellow color was formed and only traces were obtained of a solid, which was not a 1:1 copolymer. The yellow color observed when the reaction was carried out in air may be indicative of the intermediacy of a charge transfer complex in the reaction.

16693

Squire, J. M. and William A. Waters

THE ADDITION OF PHENYL RADICALS TO SULPHUR DIOXIDE. J. Chem. Soc., 1962:2068-2069, 1962. 4 refs.

Experiments were undertaken to determine the nature and reactivity of the radical-sulfur dioxide adducts of co-polymers formed when olefins and sulfur dioxide combine in the presence of a peroxide catalyst. Reaction products obtained by passing SO2 through a dry, decomposing solution of benzoyl peroxide in

boiling benzene included 4% diphenyl disulfone. Diphenyl sulfone could not be detected. The yield of diphenyl disulfone rose to 14% when SO2 was passed through benzoyl peroxide in chlorobenzene at 100 deg. The absence of chlorinated disulfone indicates that sulfone radicals produced by phenyl-sulfur dioxide reactions are too unreactive to attack benzene or chlorobenzene. Benzyl phenyl sulfone was formed when SO2 was passed through benzoyl peroxide in toluene, but this product is also attributed to the addition of phenyl radicals. It is another indication that phenyl radicals combine with the sulfur atom in SO2 to yield a stabilized free radical which the unpaired electron is again associated with the sulfur atom.

16788

Foster, P. M.

THE OXIDATION OF SULPHUR DIOXIDE IN POWER STATION PLUMES. Atmos. Environ., 3(2):157-175, March 1969. 12 refs.

Some theoretical estimates are made of the rate of growth of H2SO4 droplets nucleated by MnSO4 crystallites in a humid, SO2 polluted atmosphere. Comparison with experiment suggests that, as the acid concentration within the droplet rises, the rate of growth decreases as a result of the product acid affecting the rate of SO2 oxidation. For this reason the amount of droplet growth, and the amount of SO2 oxidation, is very sensitive to the ambient humidity, and will be greatest for saturated or very high relative humidities where droplet acid concentrations are restricted to low values. Similar calculations relating to the dusty conditions present in power station plumes are also made. These show that the rates of SO2 oxidation observed in these systems can be accounted for by the catalytic qualities of the iron present in the effluent dust. It is suggested that other oxides present also play an important part in this process in that they react with the product acid as it is formed, thus keeping the droplet in a neutral condition in which the catalyst is most active. (Author's Abstract)

16883

Halstead, W. D. and E. Raask

THE BEHAVIOUR OF SULPHUR AND CHLORINE COMPOUNDS IN PULVERIZED-COAL-FIRED BOILERS. J. Inst. Fuel, 42(344):344-349, Sept. 1969. 14 refs.

Laboratory experiments and probe tests in boilers have been made to study the decomposition of pyrite, the evaporation of sodium chloride and the formation of sulfates in the flue gas of pulverized-coal-fired boilers. The results have been compared with theoretical predictions made on the basis of thermodynamic calculations. In large boilers where there is good mixing of the fuel and combustion air it is shown that the conversion of chloride to sulfate is complete when the flue gas leaves with

only trace amounts of chloride. Initial deposits on the furnace tubes will contain significant amounts of chloride and pyrite residues when there is either a localized deficiency in oxygen, or a particularly short residence time of sulfur and chlorine compounds in the flame. (Author's Abstract)

16886

Schaefer, Vincent J.

THE INADVERTENT MODIFICATION OF THE ATMOSPHERE BY AIR POLLUTION. Bull. Am. Meteorol. Soc., 50(4):199-206, April 1969. 16 refs.

There has been a very noticeable increase in air pollution during the past ten years over and downwind of the several large metropolitan areas of the U. S. such as the northwest--Vancouver-Seattle-Tacoma-Portland; the west coast from San Francisco-Sacramento-Fresno-Los Angeles; the front range of the Rockies from Boulder-Denver-Colorado Springs-Pueblo; the midwest--Omaha-Kansas City-St. Louis-Memphis; the Great Lakes area of Chicago-Detroit-Cleveland-Buffalo; and the northeast--Washington-Philadelphia-New York-Boston. The worst accumulation of particulate matter occurs at the top of the inversion which commonly intensifies at night at levels ranging from 1000 to 4000 ft. or so above the ground. This dense concentration of air-suspended particles is most apparent to air travelers. Thus, it has not as yet disturbed the general public except during periods of stagnant weather systems when the concentration of heavily polluted air extends downward and engulfs them on the highways, at their homes and in their working areas. (Author's Abstract)

16913

Good, A. and J. C. J. Thynne

REACTION OF FREE RADICALS WITH SULPHUR DIOXIDE. PART I. METHYL RADICALS. Trans. Faraday Soc., 63(11):2708-2714, 1967. 26 refs.

The reaction of SO2 with methyl radicals, generated from the photolysis of azomethane at lambda greater than 3400 A, was studied from 25-164 C. At low temperatures, the addition reaction to form methylsulfonyl radicals is fast; as the temperature increases, the radicals become increasingly unstable. They appear not to be formed at 164 C. Arrhenius parameters were measured or deduced by a material balance method for the following reactions: CH3 + CH3N2CH3 yields CH4 + CH2N2CH3; Ch3 + SO2 yields CH3SO2; and CH3SO2 yields CH3 + SO2. A value of 0.04 was obtained for the disproportionation:combination ratio of methyl and methylsulfonyl radicals. The addition reaction of methyl radicals with SO2 is compared with their reaction with oxygen, carbon monoxide, and ethylene. Although the reaction with oxygen requires zero activation energy, the three-body limitation for the oxygen reaction leads to the conclusion that in the gas phase, the overall addition rates of methyl radicals to SO2 and O2 are similar at

50 mm Hg. Because of this similarity, sulfur dioxide-oxygen reactions with hydrocarbon radicals tend to form RSO2, not RO2, radicals as the initial addition step when sulfur concentrations are great. In reactions occurring in the atmosphere, it is expected that low SO2 concentration reactions with free radicals will occur rapidly. (Author abstract modified)

16963

Law, J.

ELECTRON SPIN RESONANCE STUDIES OF THE REACTIONS OF NITRIC OXIDE AND NITROGEN DIOXIDE WITH POLYMETHYL METHACRYLATE. Nature, no. 5056:1351-1354, Sept. 24, 1966. 8 refs.

The effect of nitric oxide and nitrogen dioxide on polymethyl methacrylate (PMMA) containing methyl methacrylate monomer (MMA) and on pure MMA was investigated with electron spin resonance (ESR) techniques. Samples of PMMA exposed continuously to nitrogen dioxide at 137 mm of mercury showed weak ESR signals with a few minutes. These signals decayed and disappeared within an hour. Samples exposed to a lower pressure of nitrogen dioxide showed larger signals that decayed more slowly. These signals showed no change in intensity when the nitrogen dioxide pressure was later increased. Samples of PMMA exposed to nitric oxide developed almost identical ESR spectra, although at high concentrations, nitric oxide radicals were stable for almost a week. Samples exposed alternately to nitric oxide at atm pressure for 48 hr and nitrogen dioxide at 137 mm of mercury lost their ESR signals; samples exposed to nitric oxide and nitrogen dioxide at 9 mm of mercury showed no change in signal intensity, indicating that each gas attacks the same site. A model for the kinetics of the nitrogen dioxide reaction gives good agreement with the experimental results.

16986

Stephens, E. R., W. E. Scott, P. L. Hanst, and R. C. Doerr

RECENT DEVELOPMENTS IN THE STUDY OF THE ORGANIC CHEMISTRY OF THE ATMOSPHERE. J. Air Pollution Control Assoc., 6(3):159-165, Nov. 1956. 5 refs. (Presented at the 21st Midyear Meeting, the American Petroleum Institute's Division of Refining, Montreal, Que., May 16, 1956.)

A special reaction vessel and infrared absorption cell with a multiple-reflection system were designed to detect the products of the photolysis of organic compounds with nitrogen dioxide in concentrations as low as a few tenths ppm. The transitory formation of ozone by the photolysis of nitrogen dioxide in oxygen was demonstrated; it was shown that if the fast back reaction between ozone and nitric oxide is suppressed by the addition of nitrogen pentoxide to react with the nitric oxide, the ozone will quickly accumulate in the system. Other products observed were

aldehyde, alkyl nitrate, formic acid, carbon monoxide, carbon dioxide, water, and an unknown compound later identified as an acyl-nitrogen compound. Aside from ozone, this compound is considered the most important product of photochemical reactions. Its role in the mechanism of nitrogen dioxide-organic compound photochemical reactions is discussed. It is believed that free radicals arising during the oxidation of organic material play a part similar to that of nitrogen pentoxide. That is, they react with nitric oxide to form the acyl-nitrogen compound, allowing ozone to accumulate in the system. The mechanism explains the parallelism between the rate of the compound formation, the rate of ozone formation, and the rate of nitrogen dioxide disapperance. It also explains the production in nitrogen dioxide-organic compound-air mixtures of ozone in concentrations in excess of the initial nitrogen dioxide concentration.

17010

Johnston, Harold S. and Kapil Dev Jain

SULFUR DIOXIDE SENSITIZED PHOTOCHEMICAL OXIDATION OF HYDROCARBONS. Science, vol. 131:1523-1524, May 20, 1960. 4 refs.

In a study of fog formation, flasks filled with sulfur dioxide, n-butane, and air were either exposed to sunlight for two min to three weeks or kept in the dark for up to six months. Liquid products that formed in the flasks were analyzed by gas chromatographic and spectroscopic techniques. Light fogs formed in the presence of sulfur dioxide and butane or sulfur dioxide and air, but heavy fogs formed only when sulfur dioxide, n-butane, and air were simultaneously present. No fogs formed in mixtures kept in the dark. The liquid which settled out was colorless (butane and sulfur dioxide) or light yellow (air) but turned dark brown when exposed to sunlight. Experimental analysis of mixed liquid products gave an average empirical formula of $C_2H_5SO_5$. Spot tests for organic peroxides were negative. The mixed products are apparently highly oxidized, sulfur-containing, organic strong acids. It is proposed that the slow, cumulative photoreactions of sulfur dioxide with organic material adds up to a significant contribution to air pollution.

17030

Shirai, Tsuneo, Yoshiaki Kudo, Masayuki Shimojo, and Saburo Yanagisawa

ION-MOLECULE REACTION OF HYDROCARBONS WITH NITROGEN MONOXIDE. (Tankasuiso to issankachisso no ion bunshi hanno). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 3(2):123-125, 1969. 3 refs.

Ion-molecule reactions between several hydrocarbons and nitric oxide were investigated in the ionization chamber of a Nier type mass spectrometer. The pressure in the chamber was raised to about 0.01 mm Hg. Gas mixtures of the hydrocarbons and nitric

oxide were prepared in the gas reservoir of the sample introduction system. The hydrocarbons were methane, ethane, propane, ethylene, and propylene with purities higher than 99%. The mixture of methane and nitric oxide exhibited peak of m/e 45 which was not observed in the single system of methane or nitrogen monoxide. At the same time, the peaks due to methane itself decreased. Similar results were obtained for the other mixtures. New peaks of m/e 59 for ethane, m/e 45, 59 for propane, and m/e 59 for ethylene and propylene became greater with increased nitric oxide pressure. It is concluded that these ions were probably formed by the reactions between fragment ions of hydrocarbons and nitric oxide or vice versa; the ions corresponded to CH3NO(+) for m/e 45 and C2H5NO(+) for m/e 59. (Author abstract modified)

17040

Ishida, Takanobu and William Spindel

CHEMICAL AND ISOTOPIC EQUILIBRIA INVOLVING LIQUID AND GASEOUS NITROGEN OXIDES. J. Chem. Eng. Data, 15(1):107-144, Jan. 1970. 18 refs.

Existing experimental data dealing with liquid-gas-phase equilibria among nitrogen oxides (NO, NO2, and N2O4) were re-examined, and an improved method was developed for calculating the gas-phase composition for a given liquid phase and temperature. The method was used to calculate chemical compositions in such systems over a wide range of temperature and total pressure. The effective single-stage separation factor for concentrating nitrogen-15 by this exchange system was also evaluated over a broad range of operating conditions. The effective separation factor for any gas-liquid system is increased by the addition of nitric oxide to the system, as long as the added nitric oxide affects the vapor phase more than the liquid phase. As the composition of the vapor phase approaches that of pure nitric oxide, a point is reached where further increases in the relative amount of 2(+) nitrogen in the system affects the gas phase composition less than the composition of the liquid phase. (Author abstract modified)

17043

Petriconi, Gianna L. and Henry M. Papee

ON THE DECOMPOSITION OF AMMONIUM NITRATE IN THE ATMOSPHERE. J. Atmospheric Sci., 27(1):164-166, Jan. 1970. 28 refs.

The process by which ammonium salts are destroyed in the atmosphere, with ultimate conversion to oxygen, nitrogen and its oxides, and water, was studied in the laboratory with unfiltered light obtained from an immersion lamp. The effects of nitrate concentration, temperature, and radiation intensity were evaluated both by analysis for nitrite in irradiated solutions and by volumetric measurements of the gases evolved during irradiation and the dark decomposition. The overall effect of apparent nitrite formation was enhanced by increases in radiation

intensity and inhibited by increases in nitrate concentration and temperature. The concurrent decomposition of nitrite and, hence, its dark decomposition, were enhanced by low pH values and high temperatures. The concurrent oxidation of the ammonium ion by transient species developed during nitrate photolysis led to a substantial increase in the acidity of the photolyzed solutions. Therefore, under suitable conditions, hygroscopic nitrous anhydride can be released from solutions. Since they are functions of temperature and radiation flux, it is concluded that the formation and photolysis of ammonium and ammonium nitrate are strongly dependent on the geographic location of a land mass.

17063

Huygen, C.

REACTION OF NITROGEN DIOXIDE WITH GRIESS TYPE REAGENTS. Anal. Chem., 42(3):407-409, March 1970. 13 refs.

The absorption of nitrogen was studied, and the equivalence NO2(-):NO2 was determined by drawing air containing NO2 through absorbers filled with water or Griess type reagents and comparing the color intensities with those obtained with standard nitrite solutions. The absorption efficiency of water was minimal; that of N(1-naphthyl) ethylenediamine dihydrochloride (NEDA) was about 40%. Even higher efficiencies were observed for N,N(1-naphthyl, acetyl) ethylenediamine toluenemonosulfonate (ANEDA) and 1,8-diaminonaphthaline. Though all reagent components influenced the absorption efficiency to a certain extent, they apparently do not react directly with nitrogen dioxide. Therefore, it is assumed that nitrogen dioxide is absorbed in Griess type reagents mainly or wholly by reaction with the amine. The infrared spectrum of the yellow substance formed by NEDA or the other amines was compatible with the assumption that N-(4-nitro-1-napthyl) ethylenediamine was obtained. A corresponding compound formed from dimethylaniline was positively identified as p-nitrodimethylaniline. The results support the hypothesis that the absorption of NO2 proceeds by a radical formation. It is suggested that acidic solutions of aromatic amines may be used as selective filters to retain NO2 but not SO2.

17146

Francini, M., S. Martini, and C. Monfrini

OSCILLOGRAPHIC POLAROGRAPHY IN MOLTEN NITRATES. IV. THE HALIDE IONS BEHAVIOR. Electrochim. Metal., 2(3):325-335, 1967. 16 refs.

Electro-oxidation of the halide ions dissolved in molten nitrate mixtures at dropping and stationary mercury electrodes were oscillopolarographically studied. By means of single sweep oscillographic polarography, the electrode reaction was demonstrated to be reversible and to involve the charge transfer of the 1-electron only. The diffusion coefficients of the halide ions dissolved in the electrolyte were measured in the temperature

range 230-270 C. Thy Ox-species of the halide are soluble in the metal phase rather than in the electrolytic one, and are capable of exchange chemical reactions with the nitrate of the solvent giving rise to its decomposition. This exchange reaction is greatly affected by nitrogen oxides and consequently by the solvent preparation procedure and salt purification. The nitrogen oxides result in an inhibiting influence of the occurrence and/or extent of the exchange reaction as well as the capability of deforming halide waves. This explains the difficulties encountered in conventional polarography in avoiding maxima. The quantitative detection of the halides in molten nitrates is a very sensitive analytical tool as quantities lower than a few ppm are easily measured. (Author abstract modified)

17155

Haagen-Smit, A. J. and M. M. Fox

OZONE FORMATION IN PHOTOCHEMICAL OXIDATION OF ORGANIC SUBSTANCES. Ind. Eng. Chem., 48(9):1484-1487, Sept. 1956. 9 refs.

Ozone formation observed in polluted air was duplicated in the laboratory. An oxygen atmosphere adjusted to 30% humidity and an irradiation time of 10 hours were selected as standards in the experimental procedure. The ozone formed was measured by the cracking observed on the bent rubber strips suspended in 5-liter flasks during irradiation. When 2-butene in concentrations of 3 ppm and nitrogen dioxide in concentrations varying from 0-20 ppm are irradiated, cracks appear at a concentration approximating 0.2-0.4 ppm nitrogen dioxide. Cracking increases until a maximum is reached at a nitrogen dioxide concentration of 2-3 ppm. After passing this maximum, the rubber cracking diminishes and at about 20 ppm nitrogen dioxide, only a few cracks appear during the 10-hour irradiation. The average rate of ozone formation during the first 10 hours of irradiation of 3-methylheptane (3 ppm) and nitrogen dioxide (1 ppm) is about 0.8 ppm/hour. The general shape of the curves obtained in the experiments was attributed to at least two simultaneous reactions: the formation of ozone; and the removal of ozone by both nitrogen dioxide and the oxidation products of the hydrocarbon. At a concentration of 3 ppm and varying concentrations of nitrogen dioxide, the hydrocarbons, n-butane, n-pentane, n-hexane, n-heptane, and di-isobutylene gave similar curves to the one obtained with 3-methylheptane, with optimum ozone formation at from 1-3 ppm nitrogen dioxide. Ozone formation is also shown by the oxidation products of hydrocarbons such as acids, aldehydes, ketones, and alcohols. The results showed that ozone formation is proportional to the product of the hydrocarbon and nitrogen oxide concentrations. The present control measures are directed mainly toward reduction of hydrocarbon, while nitrogen oxides from high temperature combustion sources continue to increase. This increase in nitrogen oxides demands greater efficiency in hydrocarbon recovery. Since the reduction of hydrocarbon emission will only be partial, it is essential to study the other component of the smog-forming system, nitrogen oxides, and to institute engineering research necessary for the reduction of nitrogen oxides released by combustion processes.

17168

Newton, Amos S. and A. F. Sciamanna

METASTABLE PEAKS IN THE MASS SPECTRA OF N2O AND NO2. II. J. Chem. Phys., 52(1):327-336, Jan. 1, 1970. 15 refs.

Metastable peaks rising from the delayed unimolecular dissociation of NO(+) to O(+) + N in the mass spectra of both nitrous oxide and nitrogen dioxide and from the dissociation of N2(+) and N(+) + N in the mass spectrum of N2O were investigated. A new metastable dissociation of N2O(2+) to NO(+) + N(+) was also studied. Further studies were made on the previously known metastable transitions of N2O(+) to NO(+) + N and of NO2(+) to NO(+) + O. The appearance potential, the kinetic-energy release in fragmentation, and the half-life were determined for each metastable transition. Comparisons were made of the energetic and half-life characteristics of the metastable NO(+) ion as produced from the sources NO, N2O, and NO2, and of the metastable N2(+) ion from the sources N2 and N2O. The results were consistent with the unimolecular dissociation of these diatomic ions, N2(+) and NO(+), proceeding by predissociation mechanisms. (Author abstract modified)

17173

Halstead, C. J. and D. R. Jenkins

SULPHUR-DIOXIDE-CATALYZED RECOMBINATION OF RADICALS IN PREMIXED FUEL-RICH HYDROGEN + OXYGEN + NITROGEN FLAMES. Trans. Faraday Soc., 65(563):3013-3022, Nov. 1969. 12 refs.

The rate of recombination of hydrogen atoms was measured in a group of hydrogen + oxygen + nitrogen flames at 2000 K containing up to 1% volume sulfur dioxide. The catalysis of the rate of recombination by sulfur dioxide was confirmed; at 2000 K, it is second order with respect to the hydrogen atom concentration. The rate of catalysis followed the reaction scheme: (1) H + SO2 + M in equilibrium with HSO2 + M (equilibrium constant K3): (2) HSO2 + H yields H2 + SO2 (rate constant k4); and (3) HSO2 + OH yields H2O + SO2 (rate constant k5). The rate determining steps were reactions 2 and 3. Values for K3k4 and K3k5 were derived which, with an estimate of K3, gave k4 approximately equal to 5 times 10 to the minus 12th and k5 less than 8 times 10 to the minus 12th ml/molecule sec. Calculations for the effect of temperature on the overall rate of reactions showed that the order of the reaction with respect to the hydrogen atom concentration changed to first order at lower temperatures. (Author abstract modified)

17195

Suzuki, Satoru

CHEMISTRY OF AIR POLLUTION (1). (Taiki osen no kagaku hanno --

Joron, sono tenbo). Text in Japanese. Kagaku Kogyo (Tokyo), 21(2):251-254, Feb. 1, 1970. 13 refs.

A series of theories about the chemistry of air pollution is presented, and the history of pollution and its problems are described. The flow of people to urban centers and the pattern of city life have increased exhaust materials. Lately, the air pollution problem has become internationalized, as illustrated by an episode occurring near the American-Canadian border. Carbon dioxide has not been considered to be an air pollutant, but its future concentrations will constitute a problem. The first problem to appear in the history of air pollution was that of smog. Though effective control methods exist, air pollution by sulfur dioxide is next in importance. The sulfur dioxide problem will be solved sooner or later, and further problems will not arise in this connection. Primary pollution is distinguished from chemical pollution, namely secondary pollution and radioactive pollution. Air pollution by smog and sulfur dioxide is primary pollution. But the primary pollutants can be converted into other harmful substances, that is, secondary pollutants. A famous example of a secondary air pollutant is the Los Angeles smog caused by ozone. Though no plant releases ozone into the atmosphere, organic compounds and nitrogen dioxide become the source of ozone in the presence of sunlight. In a subsequent article, the photochemical reactions of air pollutants will be explained in detail.

17211

Julien, Edmond and Maurice Comtat

KINETICS OF THE ANODIC OXIDATION OF NITROUS ACID AND OF NITRITE IONS ON A PLATINUM ELECTRODE. (Cinetique de l'oxydation anodique de l'acide nitreux et des ions nitrite sur electrode de platine). Text in French. Rev. Chim. Minerale, 6(5):885-900, 1969. 18 refs.

The value corresponding to the pK of the dissociation of nitrous acid enables one to distinguish in the potentiometric tests two domains of variation of the electrode potential E in mV: when pH is lower than pK, E equals 0.864 - 0.059 pH - 0.0295 log(HNO2); when pH is higher than pK, E equals 0.965 - 0.059 pH. The following net reactions were studied: HNO2 + H2O equals NO3(-) + 3H(+) + 2e; and NO2(-) + H2O equals NO3(-) + 2H(+) + 2e, which take place in several stages. Among several possibilities, two are consistent with the results of the study: formation of N2O3 in a rapid chemical reaction preceding the transfer of electric charge; and formation of the neutral HNO3 during the transfer stage which then rapidly dissociates in the stage following the electric-charge transfer. Potentiostatic, potentiodynamic, and galvanometric measurements of the system on the Pt electrode have shown that its kinetics are limited by the diffusion of the reacting species to the electrode and that there is a chemical reaction preceding the electric-charge transfer. The observations are complicated by the appearance of superficial oxide film, the kinetics of formation of which interferes with the kinetics of oxidation of HNO2, or of the nitrite ion, and which produces a passivation phenomenon to boot. A reaction scheme which accounts for both this passivation

and the orders of reactions with respect to the various species involved could be the following: HNO2(Sol.) equals HNO2(el.); HNO2 + Pt yields PtHNO2; Pt + H2C yields PtCH + H(+) + e; PtHNO2 + PtOH yields PtHNO3 + PtH; PtHNO3 yields H(+) + NO3(-1) + Pt; PtH yields Pt + H(+) + e. This scheme does not exhibit the intermediate stage which can be inferred from the results of potentiometric measurements. Yet, this is what one should expect if one assumes that the superficial oxides film can not form unless there is polarization of the electrode. The passivation phenomenon encountered in the present study is in need of a thorough investigation, particularly from the point of view of superposition of the processes of diffusion and adsorption.

17223

Hampson, R. F., Jr. and M. Okabe

COLLISIONAL STIMULATION OF THE O(1S)-O(1D) EMISSION OF OXYGEN ATOMS FORMED IN VACUUM-ULTRAVIOLET PHOTOLYSIS OF NITROUS OXIDE. J. Chem. Phys., 52(4):1930-1933, Feb. 15, 1970. 17 refs.

Oxygen atoms in the 1S state were produced by the vacuum-ultraviolet photolysis of nitrous oxide and observed by their emission at 5577 A in the 1S-1D transition. The stimulation of this emission by collision with added gases was studied. The emission was proportional to the pressure of the added gas. Xenon was the most efficient stimulator, followed in order of decreasing efficiency by Kr, Ar, N2, H2, and He. Data obtained by photolysis of NO2 and CO2 was used to estimate their quantum yields for the formation of O(1S). (Author abstract modified)

17301

Gal'tsev, A. P. and V. M. Osipov

DETERMINATION OF THE ABSORPTION FUNCTION FOR THE 9.6 AND 4.7 MICRON OZONE BANDS, WITH CONSIDERATION OF THEIR FINE STRUCTURE. Bull. Acad. Sci. USSR, Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 5(9):514-520, Sept. 1969. 17 refs. (Presented at the VII All-Union Conference on Actinometry and Atmospheric Optics, May 27-31, 1968 and at the Fifth International Symposium on Radiation, Aug. 22-30, 1968.)

The complex character of the oscillatory-rotational spectrum of the ozone molecule is a source of difficulty in attempts to obtain the radiation transmission function from band models. Of the models allowing for the fine structure of ozone bands, the familiar quasistatistical model which occupies a position midway between conventional and direct methods of calculating transmission functions is complicated to use. Moreover, it does not give the analytical relationship of the function to the parameters on which it depends. A modified statistical method is suggested which takes into account the real distribution of

spectral line intensity. The intensity and position of the rotational lines in the 4.7 micron ozone band are calculated. The transmission function is determined, and its constituent parameters permitting the calculation of radiation transmission for the reciprocal cm intervals of the 9.6 and 4.7 micron ozone bands are given. The theoretical calculations are in satisfactory agreement with available experimental results. (Author abstract modified)

17302

Dahlberg, Jan Anders

THE NON-SENSITIZED PHOTO-OXIDATION OF TRICHLOROETHYLENE IN AIR. Acta Chem. Scand., 23(9):3081-3090, 1969. 15 refs.

The nonsensitized photooxidation of trichloroethylene was kinetically investigated. The results can be interpreted in terms of a chain reaction which is probably initiated by a reaction between an excited trichloroethylene molecule and another trichloroethylene molecule in the ground state. The chain reaction yields mainly dichloroacetyl chloride, the maximum quantum yield of which is found to be about 20 at high partial pressures of trichloroethylene and oxygen. The quantum yield of phosgene is about one-fifth that of dichloroacetyl chloride. (Author abstract modified)

17330

Lesnikowitsch, A. I., J. Scheve, and I. Ebert

SEMICONDUCTION AND CATALYSIS. VI: SO2-OXIDATION ON CR2O3-ZRO2 OXIDE MIXTURES WITH SPECIAL CONSIDERATION OF THE HIGHER DEGREES OF OXIDATION OF CHROMIUM. (Halbleitung und Katalyse. VI: SO2-Oxydation an Cr2O3-ZrO2-Mischoxiden unter besonderer Beruecksichtigung hoeherer Oxydationsstufen des Chroms). Text in German. Z. Anorg. Allgem. Chem., vol. 370:40-48, 1969. 12 refs.

The catalytic properties of 10 samples of chromic oxide and zirconium oxide mixtures with 0.0 to 16.4 mole % Cr2O3 were determined using the process of oxidation of sulfur dioxide to sulfur trioxide at 450 C in a gas mixture containing initially 7 volume % SO2 as a catalytic test reaction. Of the test data, only those relating to degrees of conversion up to 20% were used to compute for each sample the reaction rate constants k', in cm/hr, and the apparent activation energy of the reaction, AE, in kcal/mole, characterizing its catalytic activity. Both quantities are plotted as functions of the mixture composition. The electric conductivity of the 10 samples were measured using a method described in the paper. The measured values were used to determine the activation energy of electric conductivity, E(sigma) in eV, which gives an energy value for the charge carriers characterizing the interaction of the electrons with the absorbed gas molecules and is plotted as a function of the mixture

composition. The apparent activation energy, AE was found to be related linearly on the relative intensity of the electron spin resonance, but differently, depending on the presence or absence of free Cr2O3 in the mixture. The catalytic and electronic properties of Cr2O3 + ZrO2 mixtures were most directly related to, respectively, the Cr(5+) ion concentration and the ratio Cr(5+)/ Cr(3+). The catalytic activity may be explained by an electron-collision mechanism, while the lowering of the apparent activation energy of electric conductivity may be reviewed as due to a charge-exchange ('hopping-exchange') between Cr(5+) and Cr(3+) ions.

17346

Kortuem, G. and H. Quabeck

STUDIES OF THE REACTIONS OF GASEOUS NO AND NOCL WITH METAL OXIDE SURFACES WITH THE AID OF IR-REFLECTANCE SPECTROSCOPY. I. (IR-reflexionsspektroskopische Untersuchungen der Wechselwirkungen von gasfoermigem NO und NOCl mit Metalloxidoberflaechen. I). Text in German. Ber. Bunsenges. Physik. Chem., 73(10):1020-1027, 1969. 36 refs.

By use of reflectance spectroscopy in the near infrared, the reactions of gaseous NO and NOCl with the surfaces of pulverized silica gel, Al2O3, SiO2-Al2O3, MgO, and CaO were studied. Because of its electron-donor-acceptor qualities, NO was a useful adsorbent to determine the surface conditions of the oxides. Knowledge of the adsorbate spectra NO + oxide helps to interpret the spectra of the NOCl adsorbed on the surface of the metal oxides. In part I, the adsorption of NO is discussed. The NO was obtained by dropping sulfuric acid into sodium nitrite which was covered with water. It was washed with 4N KOH solution and dried over P2O5. Bands of medium intensity were observed at about 2250/cm. It was assumed that with silica gel, Al2O3, and SiO2-Al2O3, the bands formed by interaction of NO with strained oxygen bridges the surfaces at which process Me (metal)-O(-) and Me...N(triple band)O+ developed. For cubic MgO and CaO, however, the mentioned bands could be related to an interaction with Me(2+) O(2-)-groups of the surface. Additional bands were found with Al2O3 and SiO2-Al2O3 at longer wavelengths which indicates bonding of NO to a Lewis-acidic Al atom of the surface.

17370

Noxon, J. F.

OPTICAL EMISSION FROM O(1D) AND O2(b1 SIGMA G) IN ULTRAVIOLET PHOTOLYSIS OF O2 AND CO2. J. Chem. Phys., 52(4):1852-1873, Feb. 1970. 24 refs.

The presence of O(1D) was detected by 6300 A emission in ultraviolet photolysis of O2 and CO2. The uv source was a xenon discharge lamp at several hundred torr pressure which emitted a continuum down to 1470 A. The light intensity of the lamp was

measured with a thermopile. The output of the reaction was detected by a 9558 A photomultiplier. Quenching rates for O(1D) and O2(1 sigma g) were measured for O2, N2, CO2, and CO. Quenching of O(1D) by O2 yields O2(1 sigma g) with nearly unit probability. The quenching rates compared well with those deduced from day airglow emission from the upper atmosphere; however a much smaller quenching rate by CO2 on O(1D) was found than that by earlier workers who used less direct methods. Photolysis of O2-CO mixtures lead to optical emission which exhibited a pronounced periodic variations in time. The quenching coefficients for O2, N2, CO2 and CO, in order, were as follows (ccm/sec): for O(1D), K1 equals 6 times 10 to the minus 11th power; k2 equals 9 times 10 to the minus 11th power; k3 equals 3 times 10 to the minus 12th power; k4 is less than 5 times 10 to the minus 11th power; and for O2 (1 sigma g) k5 equals 1.5 times 10 to the minus 16th power; k6 equals 2 times 10 to the minus 15th power; k7 equals 3 times 10 to the minus 13th power; and k8 equals 3 times 10 to the minus 15th power. (Author abstract modified)

17389

Baddour, Raymond F. and Michael Modell

THE EFFECT OF VISIBLE AND ULTRAVIOLET LIGHT ON THE PALLADIUM-CATALYZED OXIDATION OF CARBON MONOXIDE. J. Phys. Chem., 74(6): 1392-1394, March 19, 1970. 11 refs.

Reaction rates were qualitatively determined for carbon monoxide oxidation over palladium in the presence of light and in the absence of radiation. The catalyzed dark reaction rate was first order in oxygen partial pressure from 1 to 10 Torr O2. The irradiated reaction rate was measured using unfiltered light at constant oxygen and carbon monoxide partial pressures of 14.7 and 6.1 Torr, respectively, at 130 to 170 deg. The reaction rate increased by 1000% at 135 deg and 300% at 165 deg due to irradiation. The decreasing photoeffect with increasing temperature was confirmed in subsequent experiments. The irradiated reaction rate using a Vycor cut-off filter was the same order of magnitude as that observed with unfiltered light. However, with a Pyrex cut-off filter, the irradiated reaction rate was undistinguishable from that of the palladium-catalyzed dark reaction. The photoeffect is thought to be due to the excitation of an adsorbed carbon monoxide surface species by absorption of a photon. For CO oxidation over palladium, the rate-limiting step for the dark reaction is thought to be either molecular oxygen adsorption or surface reaction. Carbon monoxide inhibits the rate by reducing either the rate or the extent of oxygen adsorption. Thus, either desorption or reaction of electronically excited CO surface species could lead to an enhanced reaction rate during irradiation.

18019

Bufalini, J. J. and A. P. Altshuller

OXIDATION OF NITRIC OXIDE IN THE PRESENCE OF ULTRAVIOLET LIGHT AND

HYDROCARBONS. Environ. Sci. Technol., 3(5):469-472, May 1969. 19 refs.

The oxidation of nitric oxide has been investigated in the presence of 2,3-dimethyl-2-butene, 1-butene, 1,3,5-trimethylbenzene, and n-butane. Nitrogen dioxide dosage curves are shown as a function of HD/NOx ratios with NOx kept constant. The NO2 dosage increases very quickly with increasing concentrations of 2,3-dimethyl-2-butene and 1,3,5-trimethylbenzene. Greater concentrations of 1-butene and n-butane are required to obtain similar increases in NO2 dosage. Oxidant was observed only after maximum dosage had been achieved. No oxidant was observed for the n-butane-NOx system under the conditions employed in this study. Neither the rate of oxidation of nitric oxide nor the rate of reaction of the hydrocarbon increased when water vapor was increased from 1.1 to 11 mm. (Author's Abstract)

18025

Pitts, J. N., Jr., Ahsan U. Khan, E. Brian Smith, and Richard P. Wayne

SINGLET OXYGEN IN THE ENVIRONMENTAL SCIENCES. SINGLET MOLECULAR OXYGEN AND PHOTOCHEMICAL AIR POLLUTION. Environ. Sci. Technol., 3(3):241-247, March 1969. 70 refs.

Singlet molecular oxygen may play a significant role as an oxidant in photochemical air pollution. Reaction of electronically excited oxygen with olefinic substances produces thermally unstable hydroperoxides which may be involved in the rapid conversion of NO into NO2, a process not well understood in photochemical air pollution. Several mechanisms for the formation of singlet molecular oxygen are examined critically in relation to their possible importance in the chemistry of urban atmospheres. In each, the excitation energy is derived ultimately from the sun's radiation, but the energy may be utilized by direct absorption of radiation by ground state atomic oxygen, by photolysis of an atmospheric contaminant to form excited singlet molecular oxygen in the primary step, by spin-conserved energy transfer mechanism in which an atmospheric contaminant absorbs solar radiation and transfers its excitation to ground state atomic oxygen, or by exothermic chemical reactions involving atmospheric contaminants which themselves originated in a photochemical process. (Author's Abstract)

N. SOCIAL ASPECTS

01C69

W.S. Smith, J.J. Schueneman, L.D. Zeidberg

PUBLIC REACTION TO AIR POLLUTION IN NASHVILLE, TENNESSEE. J. Air Pollution Control Assoc. Vol. 14(10):418-423, Oct. 1964. (Presented at the Annual Meeting American Industrial Hygiene Association, Cincinnati, Ohio, May 5-10, 1963.)

Extensive air pollution studies have been completed in Nashville. One part of the study involved collection of opinions from nearly 3000 people. Opinions were solicited relative to awareness and concern about possible adverse effects of air pollution on health, property, materials, and aesthetics. Responses of the interviewed people are related to several types of pollutant measurements. The results indicate widespread concern about air pollution, and the degree of concern is, in general, closely related to the degree of air contamination experienced by interviewed people. Methodology is discussed, data are analyzed statistically, and conclusions are presented. (Author abstract)##

04058

R. Laveridge

AIR POLLUTION AND THE PUBLIC WILL. Preprint. 1967.

The public attitude towards air pollution as revealed by interviews with 43 people conducted in San Bernardino, California in May of 1966 is discussed. It is believed that although the respondents may have been occasionally bothered by air pollution, they consider smog more or less as a fact of life in Southern California. The rather apathetic attitude is attributed to the fact that the seriousness and complexities of the problems involved in air pollution are not well understood and to the lack of political involvement in air pollution problems.##

06945

M. D. Van Arsdol, Jr.

SOCIAL ORGANIZATION AND AIR POLLUTION. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 12-16, 1967. Paper No. 67-79.)

This paper summarizes a recent study of relations of air pollution to the Los Angeles metropolitan ecological system. Air pollution and other environmental hazards are ubiquitous in Los Angeles and Orange Counties. They are generated by the technologies and social organization used to convert land to urban uses and by increasing intensities of metropolitan site utilization. Los Angeles populations are now redistributing away from affecting air pollution sites as a consequence of normal metropolitan growth processes. Angelenos, however, perceive hazards, apparently to the extent that their pre-established attitudes coincide with environmental conditions. Hazard perception is related to education, and to experiences within an urban context where hazards can be expected to be present. Metropolitan populations lack knowledge concerning how to deal with hazards, but individual action may be taken by moving away from air pollution affected sites. Air pollution may possibly make for dislocation in neighborhood development, and could eventually lead to underutilization of certain metropolitan segments by hazard perceiving populations. (Author's abstract) ##

11813

Cooley, Nino, Bonnie Sun, and Robert Mintz

THE ROLE OF THE PUBLIC IN THE CONTROL OF AIR POLLUTION. PART I. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 177-194, 1968. 5 refs.

The role of citizens' groups and individual citizens in promoting air pollution control legislation in California is discussed. Despite the commitments these people have made no air pollution control, their efforts are seen as ineffective. This is attributed to the lack of inter-group communication or organization, to duplication of efforts, and to the failure of various groups to overcome public apathy to the smog problem. Suggestions are offered for coordinating the activities of antismog groups, making effective use of group influence, and informing the public of the necessity for control programs.

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Darge, I. 11965-M
Darley, E. F. *01076-B 10649-B 00237-D *05680-F *03595-G *03596-G 03612-G 03618-G *05342-G *05344-G *05723-G 05724-G
Darrieus, G. 10388-B
Das, P. K. *02247-F
Dass, H. C. *15286-G
Datsenko, I. I. *10928-F
Darwent, B. de B. 09749-M
Dave, J. V. *06043-C *12077-C *08049-D
Davidson, J. T. 00338-F 06745-F *06746-F
Davies, R. A. *03986-M
Davis, F. H. *07857-D
Davis, H. V. 00994-F
Davis, T. C. 01382-B
Davtyan, O. K. 13375-M *13936-M *13939-M
Davydov, S. A. 08161-J
DeBary, E. *00444-C *00455-C *00417-M
Decius, J. C. *15833-M
DeCorso, S. M. *08267-J
DeGraaf, H. 01257-J
DeGrazio, R. P. *06352-D
Dekoning, H. W. *10978-G *12047-G
Deleanu, M. C. *08276-F
DeLorenzo, E. J. 01889-M
DeLuisi, J. J. *18054-C
Del Vecchio, V. *03202-B
Demidov, A. V. *02439-D 07150-D
Denbigh, K. G. 13559-M
Denisov, A. M. 04634-E
De Nour, E. 02122-F
Denovan, A. S. *11755-D
Dethier, B. E. *10965-G
deTreville, R. T. P. 08423-F
Detrie, J. P. *00453-C
Detry, D. *14104-M
Deutsch, S. *09108-D
Devitofrancesco, G. 09430-C
Dev Jain, K. 17010-M
Devlin, J. P. 04580-M 05286-M 05289-M
Devorkin, H. 03010-D
Dewolf, M. Y. 05246-M

Dickinson, J. *09785-B

Dickinson, J. E. 01504-C
*04616-J 01875-M

Diehl, E. K. *01362-B
05857-E

Diggle, W. M. *03603-F

Dilie, R. M. 04668-M

Dillane, J. B. 00472-F

Dimitriades, B. *07838-D
10242-D 17339-E
06698-M 10129-M
11771-M

Dimitriades, G. *04857-D

Dishart, K. T. *11835-B

Dittmer, S. 09764-M

Dixon, J. R. *04048-F

Dmitriev, M. T. *05683-C
*04241-D *07478-J

Dmitriyev, M. T. *06867-E
*14634-L

Dobrogorski, O. J.
03082-F 03530-F
03620-F 04498-F

Dobson, G. M. B.
*03717-C

Dochinger, L. S.
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Dodd, A. E. *12392-E

Dodd, N. J. F. *16096-G

Dodonova, N. Ya.
*15536-M

Doepker, R. D.
*04456-M *09267-M

Doerr, R. C. 04618-E

Dohan, C. F. 01609-F

Dolezalek, H. *03342-C

Dolgin, I. M. *04165-C

Doll, R. 01711-D

Donahue, J. L. *07557-E

Donahue, T. M. *04527-C

Dorn, W. M. *08554-K

Dorsey, J. A. 09026-B

Dorthe, G. 15756-M

Dost, F. N. *16617-G

Doughty, R. V. *04044-D

Douglas, A. E. *15054-M

Down, P. 00511-F

Downer, T. M., Jr. 02874-D

Downing, G. *07877-K

Downs, A. R. *12171-M

Doyle, G. J. *07178-B
*01587-C 05797-D
15354-D 02440-E
*00084-F *01463-F
01603-F 03883-F
05849-M 06102-M
07108-M

Dozois, C. L. 01384-B

Drapkin, R. 11815-I

Drexler, M. *00092-D

Drinker, P. *01773-F

Drowart, J. 14104-M

Drozdova, V. M. 09438-C
10724-C

Drummeter, L. F., Jr.
00089-C

Drummond, A. J. *02285-C
*09306-C *03719-D

Drummond, D. B. 06447-G

Dryden, I. G. C. 13494-A

Duardo, J. A. *15234-D

DuBois, A. L. 07435-D

DuBois, L. *08643-D
*08644-D *08889-D

Duce, R. A. 03657-C

Duckworth, S. 03100-D
*02370-J

Duff, G. M. 09369-D

Duffee, R. A. 04040-D

Dugger, W. M., Jr.
*00655-G *00950-G
01905-G 02209-G
*02916-G 03596-G
*04576-G 04724-G
*05362-G *05774-G
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*12034-G *16950-G

Duncan, B. R. 06717-F

Duncan, R. C. 15545-C

Dunnieliff, H. B.
*13454-M

Dunning, J. A. 00121-G
00413-G 00775-G
03961-G 08843-G

Durant, D. *03066-M

Durau, F. *13684-M

Dyer, A. J. 06916-C

Dzedzichek, V. P.
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Eads, C. O. 16360-G

Eastman, E. D. *13009-M

Easton, R. E. *07657-F

Eaton, F. M. 00963-G

Eaton, M. E., Jr.
*02441-D

Eberan-Eberhorst, R.
*15321-E

Ebert, M. 16096-G

Eccleston, B. H. 14127-B 17339-B

Edmisten, N. G. 00847-J

Egger, K. W. *00128-M *01680-M *01880-M *01881-M

Eglite, M. E. *10623-F

Ehnert, W. 03233-B *03204-E

Ehrlich, R. 00933-F *01785-F 03853-F 11306-F *12079-F

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Eiden, R. 11714-C 16390-C 16392-C 15000-M 16391-M

Eilers, H. *11421-K

Eisenthal, K. B. *15055-M

Eisner, P. N. 02883-D

Ekberg, G. 06280-B

Ekin, J. W., Jr. 15166-M

Elbert, W. 02095-D

Eldridge, R. G. *08834-C

Elkins, H. B. *06680-F

Ellen, R. P. *17365-B

Ellis, C. F. *00464-B *06642-D

Ellis, C. W. 13538-E

Ellison, J. McK. 00886-D

Ellsworth, E. *12338-D

Elterman, L. *00086-C *06982-C *07000-C

Emel'lanov, I. M. *01218-F

Emel'yanov, Yu. M. 15334-D

Emik, L. O. 00281-F *11307-F 11535-F 00737-G

Emrich, G. 11562-D

Endo, R. *17106-J

Endow, N. 00084-F 01463-F 01591-F *06102-M

Engdahl, R. B. 01625-D

Engel, C. R. 04029-D *05319-D

Engelhardt, H. *10518-D

Enhalt, D. H. *06382-C

Epstein, D. *03205-D

Epstein, L. M. *15115-M

Epstein, S. S. *00728-D *00966-D *01302-D 15206-F *00663-M

Erisman, D. O. 04044-D

Ermenco, E. D. *13537-E

Ertl, D. W. *07931-E

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Esposito, G. G. *09028-B

Ester, W. 13202-E

Estes, F. L. *00658-F *01323-F *04650-F

Estes, H. D. 00787-C 07083-J

Estridge, N. K. 13182-A

Ettre, L. S. 05837-D

Evans, D. G. 00509-F

Evans, M. J. 10685-F

Ewald, H. *11562-D

Eye, M. 03761-B

Eye, M. G. 05158-D

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Fabry, Ch. *10787-C

Fagley, W. S. 00154-B 07629-B

Faingold, S. G. *15723-B

Fairchild, E. J., II *00501-F *01324-F

Faith, W. D. *09567-C

Faith, W. L. *00233-A 00344-C 05573-J

Falk, H. L. 01030-F 05584-F 08243-F

Falgout, D. A. *06385-D

Faoro, R. B. 00149-J 00698-J

Farmer, J. R. *03449-D *03866-D

Fatiada, A. J. *06720-M *06980-M *11147-M *11872

Feder, W. A. *10426-G *14826-G *15492-G

Fedorov, M. M. *07310-C

Feenan, J. J. 03796-E 07607-M

Feist, J. *02051-E 05309-E

Feldstein, M. *13860-F 03104-J *15336-L

Felmeister, A. *08897-F *11682-F

Fenimore, C. P. *02286-M

Fenimore, D. C. 09573-D

Fensterstock, J. C. *10018-C 05551-J

Fergason, J. L. *04458-D
Ferguson, J. S. *00196-D
Ferht, E. *05226-M
Fernandes, J. H. *00140-B
Ferris, B. G., Jr. *07162-F
Fetting, F. 16207-M
Fidler, A. 07648-D
Field, E. L. 16722-B
Fiero, G. W. *08376-B
Finkner, A. L. *02781-F
Fiocco, G. *08369-D
Fishburne, E. S. *06320-M
Fletcher, J. O. *14698-C
Flieger, K. 00225-K
Flury, F. *10792-F
Flynn, N. E. 00337-B
Foerster, F. *13948-M
Foitzik, L. *11724-C
Fontan, J. 04636-E
Fontanges, R. 02677-C
Fontijn, A. *07681-M
Foote, C. S. *11533-M
Foote, J. K. 00602-C *01026-M
Ford, D. 14992-D
Ford, H. W. 17142-C
Forde, A. V. *00666-J
Forissier, M. 15752-D
Forwerg, W. *14837-D
Fossard, M. *03402-D
Foster, E. G. *13574-M
Foster, K. E. 02354-D
Foster, P. M. *16788-M
Fox, F. L. 11305-D
Francini, M. *17146-M
Frank, N. R. 07162-F
Fraser, D. A. *01455-F
Freebairn, H. T. *05364-F *05698-G *07610-G
Freedman, R. W. *17380-D
Freeman, G. L. *00919-F 01040-F 02306-F *02483-F *04205-F *10970-F *11308-F *11565-F *12173-F *14377-F *15215-F
Frenkiel, F. N. *00095-C *05571-K
Frey, A. H. *07746-F
Friberg, L. *00781-J
Fried, J. *09024-F
Friedlander, S. K. *15310-B
Friedman, N. 05208-M
Frossard, M. *04900-D
Frostling, H. *01429-D
Fry, J. *00472-F
Fugas, M. *06832-D *07114-D
Fuggle, R. F. *11521-C
Fuguay, J. J. 05228-C
Fuhrman, H. *02673-D
Fukui, K. *02063-D
Fukui, S. *07364-D *16555-E
Fukuoka, S. *16554-C
Fukushima, T. *17024-D
Fuller, L. J. *11803-B
Furiosi, N. J. 02483-F
Furukawa, P. M. 06047-C

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Gajzago, L. *11505-C
Galbally, L. *10285-C
Gall, D. 09426-C
Gal'tsev, A. P. *17301-M
Gamble, B. L. *11033-E
Ganz, S. N. *13662-E *14380-M *13685-M *13688-M
Garber, M. J. 03496-G 03630-G
Gardner, D. E. 05538-F 10492-F *11670-F 16905-F
Gardner, M. B. *00639-F
Garet, R. *11815-I
Garibyan, T. A. *13364-M
Garland, B. I. *06388-D
Gartrell, F. E. *00023-B *03777-C *02921-D *04200-E
Gasiorowski, K. *05477-B
Gast, J. H. 05294-F
Gasteiger, E. L. *03785-F
Gates, C. E. 05893-B
Gates, D. M. *05577-D
Gavrilova, L. I. *08446-D
Gay, B. W. *12419-M

Geckler, R. D. 08026-F 11539-F
Gee, S. *08073-D
Gehlen, H. *13407-M *13633-M
Geissler, G. 17072-F
Gentilizza, M. 06832-D
Gentry, J. *08623-M
George, J. C. *08557-B
George, R. E. 11803-B
Georgii, H. W. *09398-M
Gerhardt, B. *13273-M
Gerlovin, Y. I. *16038-M
German, A. *10315-D
Gerstle, R. W. *01583-B *03113-B *04310-B
Grewitz, H. S. *10917-M
Ghini, G. 08499-F
Giarrusso, G. A. 09770-D
Gibson, D. E. 10752-F
Gibson, J. A. B. *15212-J
Giel, B. G. *02357-F *05037-L
Gies, H. 03772-D
Gilardi, E. F. *06107-D
Gilbert, D. L. *10551-A
Gilbert, N. 03544-D
Gilbert, N. P. 08868-C
Gilbert, R. *15502-M
Giles, C. H. *02270-H
Gilgen, A. *07821-F 07834-F
Gilkeson, M. M., Jr. 03463-F
Gill, W. E. 06618-F
Gindi, G. *11806-F
Giona, A. R. 15100-E
Girden, B. B. *15249-E
Giuffrida, L. 07749-D
Glasson, W. A. 14119-F *02838-M *03114-M
Glatter, R. B. 00087-G 03265-G *03696-G
Glick, H. S. 13503-M
Glueck, A. R. *12041-M
Goehring, M. *11965-M
Goetz, A. *06722-A *05479-B *06235-C *06632-C *05794-D *05796-D *06552-F *06551-J *01801-M *01990-M *02412-M *02904-M *05641-M *06236-M *10041-M
Gold'berg, M. S. *11489-F *06885-L
Goldberg, N. N. 04458-D
Golden, C. G. 00297-D 01691-D
Golden, J. 08655-D
Goldfinger, P. *04228-M
Goldhamer, R. E. 12402-F
Goldsmith, J. R. *18010-C 00020-F *00204-F 03519-F *03606-F *05833-F *10670-F *01955-L
Goldstein, B. D. *04317-F *06608-F *10611-F
Golesworthy, R. C. *16085-D
Gol'm, T. S. *04152-C
Golomb, D. *04461-C
Goncharenko, G. K. 15495-M
Good, A. *16913-M
Goodwine, J. K. 05599-B
Gorden, R., Jr. 03484-M
Gordon, A. R. *13489-M
Gordon, J. I. *12626-C
Gordon, R. J. *01027-C *14180-J
Gordieyeff, V. A. *03723-F
Goshgarian, B. B. 07451-B
Gottauf, M. *14500-M
Gottlieb, S. F. *15794-F *16948-F
Gourdine, M. C. 07172-E
Govorushkin, L. A. *04168-C
Grafe, K. *10937-C
Graham, T. M. 05792-F
Grahek, F. E. 09078-M
Granda, R. E. *00100-F
Grant, R. J. 03425-D
Grasley, M. H. *15634-D
Grau, R. 14188-M
Green, A. E. S. 07981-D
Green, P. D. 10066-M
Greenbaum, R. *16614-F
Greenburg, L. 00204-F

Gregg, S. J. *13412-M

Gregory, A. R. *08100-F *14050-F *00316-G

Gregory, K. L. *10514-F

Griffin, G. W. 00356-M *02445-M

Grigoryan, G. O. *10591-E 16209-M

Griffiths, J. F. *04281-D

Griffiths, M. J. 04281-D

Griggs, M. *07980-C

Griswold, S. S. *05864-B *00107-E *08075-E *01017-J

Groll, A. *11902-C

Gronsberg, E. Sh. *02135-D *07146-D *11903-D

Gross, G. P. 14424-E

Gross, P. *00836-F *08054-F *08423-F

Grosskopf, K. *01740-B

Grovenstein, E., Jr. *01194-C

Gruber, C. W. 05336-J

Grumer, J. *07881-E

Gruson, G. *12990-B

Gualtierotti, R. *08499-F

Gucker, F. T., Jr. *04968-D

Gudiksen, P. H. *07867-D

Guibet, J. C. 09715-B 12588-B 16627-B 14531-E

Guillement, F. B. 05666-G

Guillerm, R. *16302-F

Guillory, W. A. *01787-M

Gunther, S. 05580-D

Gunn, R. *05405-C

Gunton, R. C. *02328-M

Gupta, S. K. *13087-D

Guse, W. 11061-D

Gushchin, G. P. *04172-A *04158-C *04163-C *04157-D *04160-D *04173-J

Gussey, P. 04771-M

Guthmann, K. *01528-E

Gutman, L. N. 05121-D

Gutnick, M. 04977-C

Guttenberg, J. F. 16574-M

Guyer, M. 04328-D

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Hackney, J. D. *08424-F

Haagen-Smit, A. J. *16251-A *01326-C *04579-D *01645-E *04338-E 00229-G *04992-M *17155-M

Haentzsch, S. 14213-D

Hagopian, E. *15317-M

Hahn, E. 07173-F

Hale, E. A. *14404-E

Hall, E. L. 04995-B

Hall, M. A. 04707-G 06417-G 11320-G

Hallett, W. Y. *00672-F

Halliday, E. C. 05932-A 07119-D 07121-E

Halstead, C. J. *17173-M

Halstead, W. D. *16883-M

Hamada, A. 08320-F 11459-J

Hamill, P. V. V. *01992-F

Hamill, W. H. *14155-M

Hamilton, H. L., Jr. *10682-C

Hamilton, P. M. *01446-D

Hamilton, R. A. *00274-D

Hamilton, W. F. *05149-E 05613-M

Hammer, D. I. *00742-F

Hamming, W. J. *00502-C *01504-C *03270-F *08403-F *05110-J *08558-M

Hammond, G. S. 15046-M

Hampson, [illegible] *07716-C

Hampson, R. F., Jr. *17223-M

Hanke, E. 12990-B

Hansbrough, J. R. *07786-G

Hanst, P. L. *11330-D

Happ, J. W. *00418-D

Harden, D. G. 15211-F

Harding, C. I. 06385-D 00959-E

Harding, J. W. *13900-M

Hardison, L. C. *08055-B

Harkins, J. *05599-B 03103-D 14025-E 03978-F 05611-M 06068-M

Harkness, A. C. *00952-C *06719-M 08254-M

Harner, F. M. 16313-G

Harries, C. *10788-A

Harrington, J. B., Jr. *04355-C

Harris, M. E. 07881-E

Harris, R. L., Jr. 00179-D

Harris, S. W. *14031-E

Harris, W. C. 11835-B

Harrison, A. P., Jr. *07463-M

Harrison, H. *04465-M

Harstad, J. B. 00418-D

Harteck, P. 13540-M

Hartkamp, H. *16117-M

Hartman, K. O. *02446-M

Hartree, E. F. *13457-M

Haseba, S. *13415-M

Hashimoto, M. *16135-B *17188-K

Hass, G. C. *00324-B 12011-B

Hatch, T. F. 02266-F

Hatchard, R. E. *00528-J

Hathaway, C. E. 08838-D

Hathaway, J. A. *01993-F

Hatterer, A. *15752-D

Haugen, G. R. 07458-M 11864-M

Haught, A. F. *15138-M

Hauser, T. R. *00214-D *01802-D 02090-D *03537-D

Hautefeuille, P. *10910-M

Havens, A. V. *05920-C

Havir, J. *07648-D

Hayakawa, T. *13324-M

Hayashi, S. *07371-J *07529-J

Haydon, G. B. 00919-F *01040-F *06745-F 12173-F

Hayhurst, A. *12259-M

Heagle, A. S. *12149-G 17057-G

Healy, T. E. *16857-D

Hearst, P. J. *05233-H

Hechter, H. H. *03519-F

Heck, W. W. *00242-C *00760-D *11305-D 00121-G *00775-G *03961-G *05610-G *08843-G *11072-G *15559-G *17057-G

Hedlund, F. *06280-B

Heggestad, H. E. *00184-G *00953-G 01421-G *02744-G *04582-G *10674-G *12042-G 14963-G 14966-G

Heicklen, J. 02517-M 02534-M 02535-M *03488-M 04277-M *04583-M 07500-M *07717-M

Heiman, H. *00047-F *00281-F *00308-F 03421-F

Henderson, J. J. 00220-B

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Heinz, W. B. *11604-D

Helbig, H. *16335-D

Heller, A. *07597-K

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Henderson, D. 01145-C 01412-C

Henderson, J. J. 04325-J

Hendricks, R. H. *01393-D

Hendrix, W. P. 00069-M

Hengstenberg, F. 06048-F

Henriksen, T. *16070-M

Henry, M. C. *11306-F 12079-F 16707-F

Henschler, D. *07173-F *10791-F *10779-F *11470-F

Henson, R. M. 09755-M

Hentel, W. 02155-D

Hepting, G. H. *01014-G *01398-G *12043-G

Hering, W. S. *04292-C *06918-C

Herkstroeter, W. G. *15046-M

Herman, B. M. *01405-C 12627-C

Hersch, P. A. *10672-D *14550-D

Hersh, C. K. 06169-J

Hess, L. D. 00789-C 02493-M *07798-M *08877-M

Hess, R. E. *08758-C

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Heuss, J. M. *14119-F

Hewson, E. W. *07872-C *03091-B

Hexter, A. C. 11335-F

Heywood, J. B. 17335-B

Hiam, L. *16616-D

Hibben, C. R. *14063-G
*15332-G *16362-G

Hidalgo, A. F. *05482-C
*10027-M

Hidy, G. M. *04677-C

High, M. D. 03468-B
*03468-J

Hildebrandt, P. W.
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Hill, A. C. 07455-G
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Hill, H. 15184-M

Hill, S. R. G. 01019-F

Hinch, N. *18005-A

Hindawi, I. J. 01818-D
*00961-G *00413-G
*05131-G

Hine, C. H. *00428-F
*03890-F *05637-F
14050-F

Hinners, R. G. *00142-D
*01987-F

Hirao, O. *06144-E

Hirashima, M. 13324-M

Hiratsuka, A. *00446-C

Hirsh, M. N. *02883-D
*04283-M

Hisatsune, I. C. *00700-M
02446-M *03349-M
*04578-M *04580-M
05286-M *05288-M
*05289-M *09576-M

Hitchcock, L. B. *05573-J

Hoare, E. E. *08353-M

Hocheiser, S. *00192-D
*00635-D *01086-D
*02745-D *11855-D
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Hocker, A. J. 11237-D

Hodge, M. W. *04467-D

Hodges, G. H. 11581-G

Hodgson, F. N. 08033-B

Hodkinson, J. R.
*01396-C

Hofer, L. J. E. *00015-E
*04771-M

Hoffmann, H. *08802-B
*08497-B

Hofmann, A. W. 16218-M

Hofmann, P. *14201-D

Hofmeister, H. K.
*09721-D

Hogger, D. *08801-F

Holbrow, G. L. *07127-D

Holland, G. J. *15490-F

Hollax, E. *14450-M

Hollenbeck, A. H.
01357-D

Holzman, R. S.
*10492-F 11670-F
*16905-F

Holzworth, G. C.
*02360-C *03068-C

Homann, K. H. *08056-M

Honey, R. 02199-D

Hood, L. V. S. *11567-D

Hoover, G. M. *08838-D

Hopper, C. J. 03102-C

Horai, Z. *07591-F

Hore, T. *10752-F

Horiuchi, K. *07166-J

Horn, K. *11568-F
*00411-L

Hornedo, M. D. *03505-J

Horstman, S. W. 00005-J

Horsley, R. R. 06086-B

Horton, A. W. 01395-D

Horton, J. F. 01495-D

Hosler, C. R. *03725-J

House, W. B. *06341-F

Hovey, H. H. *00673-B

Hsieh, Y. H. *14007-E

Huber, G. L. 16420-F

Huber, T. E. *00932-F

Hudson, G. *16266-J

Huenigen, E. *14475-L

Hueper, W. C. *02288-F

Hueter, F. G. *00473-F
02332-F *03823-F
07842-F

Huey, N. A. 00329-D

Hughes, A. N. *07498-M

Hull, H. M. *04998-G

Huls, T. A. *09323-B

Hummel, H. *02645-D
09721-D

Hunt, B. G. *01458-C

Hunter, H. H. *11197-D

Hurn, R. W. *01382-B
*01384-B *00241-J
*06698-M *10129-M

Hussey, C. E. 08267-J

Huybrechts, G. 04228-M

Huygen, C. *17063-M

Hylyi, M. F. *16515-F

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Ichihashi, M. 06800-D

Ichinosawa, A. *14553-F

Ilgenfritz, E. M. *00730-J

Il'nitskaya, A. V. *08461-F

Il'nitskii, A. P. *10637-E

Impens, I. I. *03163-G

Inaba, H. *16881-D

Inbar, M. 13446-F

Ingels, R. M. 00345-C

Ingram, W. T. *08655-D

Inove, R. *04181-B

Inscoe, M. N. *06955-D

Ioshpa, I. Ye. *14384-M

Iozenas, V. A. *04150-D

Ipsen, J. *01609-F

Ireland, F. E. *16022-D

Iritani, T. 04181-B

Irvine, W. M. *11280-C

Israel, G. W. 03857-C

Israel, H. *03857-C

Ishida, T. *17040-M

Itoo, K. *16534-C

Ivanov, V. N. *14570-M

Ivanova, F. A. 04221-F

Ivanova, R. N. 01758-C

Ives, N. F. *07749-D

Ivie, J. O. 01349-D *05892-D 06460-D 06459-G

Iyengar, R. D. *14179-M

Iyengar, T. S. *01462-D

Izmerov, N. F. *08153-F

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Jaccard, G. *09008-J

Jackson, H. O. 14351-G

Jackson, M. W. *05323-E

Jackson, W. E. 00679-B

Jacobs, J. 11263-B 10037-M

Jacobson, J. L. 07798-M

Jacumin, W. J. *02747-D *00992-F

Jaffe, L. S. *00613-C *00787-C *08330-C *00980-F *04321-F *04322-F *04323-F *09061-F *09565-F *11045-F *12175-F *04320-H *07083-J 05545-L

Jaffe, S. *11279-M *13889-M

James, D. W. *14092-M

James, M. R. 05047-M

Jansen, L. *13253-M

Jaros, G. D. *00469-D

Jegier, Z. 10978-G 12047-G

Jenkins, I. *11522-C

Jenkins, D. R. 17173-M

Jennelle, L. F. 11632-F 16738-F

Jensen, D. A. *00504-B *01624-B

Jeung, E. 03269-F

Johne, R. *01711-D

Johnson, B. L. 00872-D

Johnson, F. A. 08077-D

Johnson H. 01839-D *12045-G

Johnson, H. W., Jr. *02494-M 05100-M

Johnson, J. E. 03969-M

Johnson, M. C. *16306-D

Johnston, D. R. 00992-F

Johnston, H. D. *07500-M

Johnston, H. S. 01787-M 01878-M *02534-M 02535-M 03488-M 04583-M *06954-M *07499-M *13564-M *17010-M

Johnstone, H. F. 14902-E *07082-M

Jonathan, N. *14917-M

Jones, G. W. 02286-M

Jones, I. T. N. *15746-M

Jones, J. L. *01591-F

Jones, M. H. 00177-C

Jones, R. A. 06201-F

Jordan, R. C. 02841-D

Joseph, S. W. 00932-F

Josephson, A. S. *02173-F

Joubert, J. *02677-C

Juda, J. *07264-C

Julien, E. *17211-M

Junge, C. *09431-C *10182-C 07655-D

Jutze, G. A. *00179-D *01791-E *02174-E 01095-J *02174-K

Juvet, R. S., Jr. *08105-M

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Kabanov, M. V. 15476-D

Kadlec, B. 13002-M

Kain, M. L. *07938-D

Kalika, P. W. *09310-C

Kallai, T. 01990-M

Kalyuzhnyi, D. N. *08161-J *08194-K

Kane, G. L. 02826-F

Kanitz, S. *16927-J

Kano, R. *07379-D

Kanno, S. *07482-D

Kantner, C. V. *02610-B

Kapkaer, E. A. *08524-B

Karapetyan, R. V. 14909-M

Karimova, G. U. 04165-C

Karney, J. L. *06481-C 11274-C

Karol', I. K. *04167-C

Karp, I. N. *13267-M

Kashtanov, L. I. *16463-M

Kasner, W. H. 02456-M 04437-M

Kato, K. 05451-C *06785-C *06786-F

Kattawar, G. W. *08868-C 09466-C

Katz, M. *03556-A *01640-C 05299-D *08762-D *00585-G 00696-G *01270-J *04996-J *05499-J *09259-L

Kauper, E. K. *03102-C

Kautsky, H. 11959-M

Kawamura, K. *04562-J

Kawanami, Y. *07198-C *07198-J

Kawano, M. 03842-C

Kaye, S. *16721-D

Kayne, N. 03762-E

Kazakova, E. A. *16726-E

Keagy, D. M. *03458-J

Keating, G. M. *01610-C

Kelble, D. L. 09412-F

Kelley, J. J., Jr. *12632-C 16618-C *03159-D 08311-D

Kelly, F. J. *06618-F

Kelso, J. R. *03016-M

Kendrick, J. B., Jr. 03608-G 03609-G 03610-G *05723-G *05724-G

Kenline, P. A. *00638-F

Keng, E. Y. H. *11310-C *12165-C

Kenizys, F. X. 03149-M

Kennealy, J. P. 00360-C

Kennebeck, M., Jr. *04609-B

Kenny, C. N. 12041-M

Kensler, C. J. *08021-F

Kerker, M. 04623-D

Kerns, E. A. *05151-E

Khesina, A. Ya. 10637-E

Kettner, H. *07693-C

Khan, A. U. *07257-C

Khanna, B. N. 04407-M

Khiterer, R. Z. 16726-E

Khrgian, A. Kh. 04161-C 04164-C 01752-C *16342-C

Kilburn, K. H. *13525-M

Kimotsuki, K. 05378-M

Kimura, K. 06192-J *03160-M *05378-M

Kindsian, J. R. 00157-L

King, I. R. *05043-M

King, W. H., Jr. *15200-D

Kipot, N. S. *16157-E

Kirkwood, D. H. *14747-M

Kistiakowsky, G. B. *12046-M

Kita, N. *13160-E

Kitagawa, T. *17327-B

Kitrosskii, N. A. 04241-D

Klein, F. S. 11279-M 13889-M

Klein, J. J. 13503-M

Klein, R. *01683-D

Kleinerman, J. *14081-M

Kleinert, T. N. *13484-M

Kleinfeld, M. *00165-F

Kleinjung, E. 09398-M

Klejnot, O. J. 10041-M

Kling, R. G. 05866-D

Klosterman, D. 00622-F

Klosterman, D. L. *00122-D

Klosterman, L. L. 01402-F

Knauer, A. *08805-C

Kneizys, F. X. 00371-M

Knipovich, O. M. *15334-D

Knott, M. J. *16261-M

Kobayashi, J. 09907-D

Kobayasi, T. 16881-D

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Kojcharova, M. 14471-M

Kolsaker, P. 08705-M

Kon, H. *15817-M

Konopinski, V. J. 03255-B

Kopczynski, S. L. *01825-C 02359-C 03858-C 05533-C 05343-D 12362-D 08845-M 12320-M

Koppe, R. K. 01784-D

Kornblueh, I. H. *05927-F

Kornfeld, G. *16429-M

Koroleff, F. *06919-D

Korshover, H. 08625-C

Korth, M. W. 02375-B *00068-D *02842-F

Kortuem, G. *17346-M

Kostoveskii, Y. I. 08194-K

Kota, S. *13786-M

Kotaka, S. 00609-F 03726-F 05241-F 15725-F *00433-G 00577-G *00601-G 00604-G 00786-G 01449-G *01697-G 07864-G *15382-G *17210-G

Kotlny, E. L. *00856-D 00956-D *02045-D

Kotin, P. *01030-F *01844-F *05584-F *08243-F

Koukol, J. 00950-G 04576-G *07501-G

Koutsoukos, E. P. *00101-M

Kouznetzon, G. I. *01752-C

Kovitz, R. 00955-C

Kozyrev, B. P. *15729-C

Kraus, K. *15380-M

Krause, F. E. 04626-M

Kreichelt, T. E. 02825-J 02840-J

Krenz, W. B. 11074-K

Krilov, N. A. *05383-D

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Krizek, J. *03218-D

Krueger, A. P. *06265-E *00609-F *01957-F *03726-F *05241-F *06264-F *08842-F *15383-F *15725-F *16155-F 00433-G *00577-G 00601-G *00604-G *00786-G *01449-G 01697-G *07864-G 15382-G 17210-G 13786-M

Krupenie, P. H. 04965-M

Kuczynski, E. R. *05078-D

Kudo, Y. 17030-M

Kudryavaseva, L. A. *04149-C

Kuers, G. *08284-D

Kuhn, M. *02648-E

Kuhn, W. R. *16889-C

Kul'kova, N. V. *16167-M

Kunde, V. G. *11406-M

Kunz, H. 14675-M

Kupchanko, E. 02370-D 02370-J

Kuratsune, M. 02853-M

Kurfis, K. R. 00191-C

Kurin, N. P. *14055-M

Kurker, C., Jr. 07552-E

Kuwana, T. 07085-M

Kyono, J. 01483-F

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Kuznetsov, G. I. *04154-C 04161-C 04164-C

Kuznetsova, A. P. 04159-C 04150-D

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Laamanen, A. 01794-F

Ladu, M. *16691-E

Laffey, W. T. *10660-E

Lagarde, E. 13058-F

Lagarias, J. S. 00250-B

Lage, L. J. 02158-D 04796-D

Lagerwerff, J. M. *02826-F

Lagutin, Ye. I. *16274-J

Lahmann, E. *02681-D *02987-D *11573-D *11574-D *13422-D *11627-J *14776-J *15557-J

Lair, J. C. 07613-E

Lamantia, C. R. *16722-B

Lamb, D. R. *11828-A

Lamer, V. K. 04967-M

Lampe, K. F. *03490-F

Landau, E. 00306-F 00307-F *05422-G

Landen, E. W. *12176-B

Landolt, P. A. 16705-F

Landsberg, H. E. *03373-C 11523-C *00259-F *02361-J

Lang, H. W. *15484-D

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Langheld, K. 10788-A

Langley, R. A. 03022-C

Large, L. N. *15184-M

Larsen, L. B. 01393-D

Larsen, R. I. *00798-B *00962-B *05912-B *00435-D *01807-D *03520-D *00110-J *00321-J *00435-J *00739-J 06188-K *10485-L

Larson, E. C. *07187-E

Larson, G. P. *07623-B *05575-C

Laseter, J. L. *10119-M

Lauer, J. L. 01112-M

Laurence, K. M. *11575-F

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Laux, W. 10779-F

Laveridge, R. *04058-N

Lavoie, G. A. *17335-B

Lavrinenko, R. F. 16458-C

Law, J. *16963-M

Lawson, W. H., Jr. *10071-F

Lawther, P. J. *00310-F *08415-F *00218-J

Lea, D. A. 06481-C *11274-C 15831-C

Leach, P. W. *01958-B

Leavitt, R. 01699-F

Lebowitz, M. D. 09440-F 11346-F

Lecher, D. W. 10965-G

Ledbetter, M. C. *04684-G

Ledford, M. 03968-M

Lee, G. *14325-E

Lee, R. C. *14975-E

Lee, R. E., Jr. *01033-D

Lee, Y. S. 03759-B

Lehman, R. L. *04381-A

Leighton, P. A. *00969-B *01422-D *04633-M

Leipper, D. F. *10436-C

Leithe, W. *07535-A

Lemke, E. E. 04962-E *03462-J

Leng, J. K. 03076-F

Leng, L. J. 01958-B 02098-D

Leone, I. A. *09549-C *01666-G 01800-G *03092-G 03585-G 05420-G *06557-G *12155-G 16311-G 16704-G

Leovy, C. B. *12634-C

LePera, M. E. *03164-B

Lesnikowitsch, A. I. *17330-M

Levine, M. *12105-C 05149-E *05613-M

Levine, S. G. 01186-M

Levitt, B. P. 13341-M

Levy, A. *15351-B 04831-M *05302-M *07883-M *10043-M

Levy, E. J. *05404-D

Lew, M. *07884-E

Lewis, R. J. *05548-D *07885-D 01791-E

Lewis, R. P. *05070-D *03466-J

Lewis, T. R. *02332-F *03463-F *07842-F

Leyhe, E. W. 03446-M

Leyshon, L. J. *00611-C

Lias, S. G. 00629-C 01833-M 09267-M

Liberti, A. *09430-C

Lichtenstein, S. *08645-M

Liddell, H. F. *15301-D

Ligda, M. G. H. 01188-D

Lillington, G. A. 00338-F 06746-F

Linch, A. L. *01236-D

Lindberg, W. *13952-A

Lindgren, P. H. 01429-D
Lindholm, E. 02464-M
Lindzen, R. 01305-C
Lindzen, R. S. *01406-C *01407-C *01408-C
Linnell, R. H. *02786-D
Linsky, B. 11052-C
Linville, W. *03759-B
Linzon, S. N. *02313-G
Lippmann, M. 01192-D
Litt, R. S. *11807-F
Littman, F. E. *17142-C
Liu, B. Y. H. *00864-D *01704-M *06189-M *11205-M *11783-M *11784-M
Livingston, R. 00426-D
Lloyd, D. H. *08646-F
Lodge, J. P., Jr. *03674-A 10513-D *01427-J *07103-J
Lodi, C. 10611-F
Lodwick, J. R. *05300-E
Logan, W. P. D. *00570-F
Lohner, K. 00269-E
Lokshin, M. A. 13688-M
Lombardo, F. A. *01103-C
Lombos, B. A. *09030-M *09031-M
London, J. 16889-C
Long, R. 05325-M
Longfield, A. N. *02155-D
Lonneman, W. A. *09598-J
Loosli, C. G. 11297-F 13852-F
Lopukhova, G. S. 11498-D
Lord, S. S., Jr. 01236-D
Lortie, J. *13020-M
Louw, C. W. *02415-D *07119-D *07120-J
Lovill, J. E. *10980-C
Lowry, W. P. *09311-C
Lozhkin, A. F. *14073-E
Lubowe, I. I. *01077-F
Ludmann, W. F. 00192-D 11855-D
Ludwig, B. E. *16236-M
Ludwig, C. B. *12887-D
Ludwig, F. L. *00855-D
Ludwig, J. H. *00186-B *01488-B *02362-B *04808-B *16263-B *01167-E *09060-F 01830-J
Luk'yanchikov, V. S. 14554-E 14385-M
Luk'yanitsa, A. I. 13662-E
Lunche, R. G. 02610-B *04962-E 03270-F *08556-K
Lund, H. F. (ed.) *00131-E
Lundeen, G. *00426-D
Lundgren, D. A. 03563-M
Lunge, G. *10907-M
Lunge, G. H. 14620-M
Luther, V. H. *00269-E
Lutner, R. F. *01168-F
Lutz, G. A. *02788-M
Lynch, A. J. *07390-J
Lynn, D. A. *00783-C 06841-C *01883-F *01912-J
Lyshkow, N. A. *03096-D

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MacBeth, W. G. 00502-C 16846-C
McCaa, D. J. *14146-M *15829-M
McCabe, L. C. *00250-B
McCaldin, R. O. *03527-D
McCarroll, J. R. *00681-F *01369-F *09440-F
McCarty, B. *14727-E
McCormick, R. A. *00191-C *00764-C *05282-C *02363-D
McCormick, R. N. 00925-M
McCrone, W. C. 03474-D
McCully, C. R. 06984-D
McCune, D. C. 06404-G 17109-G
McDermott, W. *05203-F
Mac Donald, A. J., Jr. 07103-J
McDonald, R. D. 00124-D *00123-F 01737-F *01738-F 02163-F
MacDowall, F. D. H. *05279-G
MacEwen, J. D. 07709-D 01346-F *03812-F *08026-F *11539-F
McGraw, G. E. *03493-M 06954-M
McKay, H. A. C. *14411-C
McKee, J. E. *00359-K
McKee, J. W. *10327-K

McKee, S. B. 03466-J

McKenna, J. M. *13327-M

Mackenzie, V. G. *00024-B *00225-K

MacKnight, M. L. *16273-G

MacKu, M. *08487-D

MacLean, D. C. *06404-G *17109-G

McLean, D. R. 04667-D

MacLeod, J. A. 03621-D

McLouth, M. E. *07072-K

McManus, T. T. 05096-G 07445-M

McMichael, W. F. *00271-B

McMillan, G. R. *01961-M 03066-M 16236-M

McMilean, R. S. *16794-F

McMullen, T. B. 01912-J *05551-J

McNeil, K. M. 09186-M

McNerney, J. M. *01346-F *03820-F

MacPhee, R. D. *05158-D 08403-F 05110-J

McQuigg, R. D. *11243-M

Maddox, F. D. 03004-J 03027-J

Mader, P. P. *03760-B *03761-B 05801-C *09238-C

Maessen, J. G. H. 13843-M

Maga, J. A. 02360-C *01211-K *11734-K *00157-L *01400-L *08679-L

Magill, P. L. *04973-D

Magone, K. 00446-C

Mahenc, J. 15755-M

Maher, G. R. *07483-K

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Malbos, M. P. *00897-K

Malinoski, V. F. 10514-F

Malinowski, E. 09232-F

Mallon, M. H. 01026-M

Malysheva, I. N. 13248-M

Mamon, L. I. 13685-M

Manakin, B. A. 13939-M

Manakin, G. A. 13899-E

Manchot, W. *13224-M

Manganelli, R. M. 06080-C 04499-D 06107-D

Mani, J. C. 08827-M

Manita, M. D. *08436-D

Mannella, R. J. 06640-F

Manning, R. N. 10660-E

Mantashyan, A. A. 13364-M

Manvelyan, M. G. *16195-M *16204-M *16209-M

Marchesani, V. *06406-D

Markush, R. E. *00313-F

Marraccini, L. 10390-F 08297-J 09391-J

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Marsh, D. 02517-M

Marsh, K. J. *16016-D

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Martelli, T. *03850-K

Martin, A. E. 00310-F

Martin, D. O. 01842-B

Martin, G. B. 01264-C

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Martini, S. 17146-M

Mase, K. V. *08485-J

Mason, J. 10683-C

Massa, V. F. *14424-E

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Mast, G. M. *04767-D

Mastin, R. G. *01377-B

Masuda, Y. *02853-M

Mateer, C. L. 12077-C 08049-D

Matheson, D. H. 00666-J *00688-J

Matijevic, E. *04623-D 04801-M

Matle, C. C. *02518-D

Matsak, V. G. *08162-E

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Matson, W. R. *10528-D

Matzen, R. N. *01368-F

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Mayo, R. R. 05058-M

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Meadows, F. L. *01685-D 00534-J *04325-J 08327-J

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Meckler, M. *10985-I

Mee, T. R. *09113-C

Meeker, J. E. 03426-J

Meerburg, A. J. 13153-D

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Meijer, R. J. 15243-M

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Melchiorri, C. 08296-D

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Melekhina, V. P. *08154-F

Melnychuk, D. O. 16515-F

Mende, T. J. 03490-F

Mendenhall, A. L., Jr. 01021-D

Menet, J. P. *13058-F

Menser, H. A., Jr. *11581-G *01421-G *14963-G *14966-G

Merrifield, P. R. *05792-F

Merryman, E. L. *04831-M 05302-M 07883-M 10043-M

Meyer, E. *15347-C

Meyer, R. T. *10034-D

Meyerand, R. G., Jr. 15138-M

Meyers, F. H. 03890-F 05637-F

Michael, B. D. 16097-M

Michailova, E. A. *13528-M

Middleton, J. F. 01000-A 12177-A 04592-E 05894-E 05968-E *00229-G *00737-G *01809-G 02299-G *03608-G *03609-G *03610-G *03611-G *03612-G *03613-G *03615-G *03616-G *03617-G 03628-G 04582-G 05344-G 05902-G 05903-G 00526-J 06146-K 07605-L

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Miller, R. J. 17038-G

Miller, S. 00738-F

Miller, S. E. 15351-B

Miller, W. J. *11210-M

Millman, S. *06993-C *06994-C

Mills, C. A. *01327-F

Mills, E. S. 09238-C

Mingle, J. G. 00569-E

Minhk, A. A. *01219-E *06669-F

Minkh, A. A. *13248-M

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Mirev, D. *13916-M

Mirzoyeva, L. M. *13894-M

Mishchenko, Yu. S. 13897-M

Mitchell, H. C. 00644-J

Mitchell, R. I. 01197-D *01625-D

Mitra, A. P. *02520-D

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Mokhov, L. A. 02439-D

Molchanovo, S. I. 11770-M

Moll, A. S. 07082-M

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Monroe, J. 02781-F

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Moorman, W. J. 16055-F

Moos, H. W. 15118-M

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Mourik, J. H. *08735-B

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Mrose, H. *09439-C

Mucskai, L. *15087-E

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*01060-F *01699-F
*06415-F 00655-G
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Mueller, W. J. *09441-M

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Mukammal, E. I. 05279-G

Mukherjee, N. R.
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Munn, R. E. 00688-J

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Murcray, D. G. *00840-C

Murphy, S. D. 00617-F
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*01090-F 01324-F
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*04698-F

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Nadel, J. A. 10670-F

Nader, J. S. *01481-C
*00051-D 00620-D
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*05099-M

Naiman, C. S. *05246-M

Nakadoi, T. 00328-D

Nakajima, K. *17414-E

Nakamura, K. *11425-F

Nakano, T. *15948-E

Narcisi, R. S.
*03022-C 01114-D

Narita, G. *13758-C

Nash, T. *08859-D
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Neerman, J. C. 00160-D
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*02938-C *03381-C
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Neligan, R. E. *05097-B

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Neuberger, H. *00236-C
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*02335-B 13951-B
*09315-D 01375-E
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Newton, J. W. *00231-M

Ng, Y. S. 00053-M

Nichols, C. W. 05342-G

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Nickol, H. A. 09323-B

Nicksic, S. W. 03103-D
*03978-F *05611-M
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Nicol, C. H. *01649-C

Nicolet, M. *05205-C
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Niessen, H. L. J. 01432-D

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Ninomiya, J. S. 13034-M

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*05103-G

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Novak, J. R. 11188-M
*15491-M

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*09341-B
Odaira, T. 16554-C
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*02258-M

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*05745-G *06417-G
*06498-G *06499-G
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*15578-G

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Orr, C., Jr. *05482-C
*06418-C 11310-C
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Overberger, C. G.
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*00355-M

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*05200-J

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*05294-F

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Parker, W. R. *00329-D
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Partridge, R. A. *06011-F
Pate, J. B. 01427-J
Patrick, R. L. *08027-F
Pattison, J. N. *00325-B
Pattle, R. E. *00511-F *00995-F 02533-F 03593-F
Paul, D. G. 05404-D
Pauletta, C. E. 07921-E
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Pavlik, I. *09239-F
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Peacock, P. R. *09241-F
Peak, M. J. *16780-F
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Pejack, E. R. *09172-M
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Perkins, W. A. 01422-D
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Peters, G. H. *05048-E
Peters, M. S. *14196-E 13530-M
Peterson, C. M. 00578-D *10296-D
Peterson, C. O., Jr. *07540-D
Peterson, D. C. *07099-F
Peterson, J. T. *15390-C
Peterson, R. F. 04310-B 01583-B
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Petrenchuk, O. P. *09438-C *10227-C
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Petriconi, G. L. *17043-M
Petrilli, F. L. *03115-F *04054-F
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Pfaff, J. D. 00386-D 00868-D
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Pfeiffer, W. 05628-M
Phair, J. J. 01520-F 05913-F
Phelps, A. V. *02456-M *04437-M *05253-M *15071-M 16375-M
Phelps, H. W. *00645-F *00983-F 01698-F *02420-F *03529-F
Phillippo, K. A. 16916-F
Phillips, D. *02337-M
Phillips, G. B. *06627-B
Phillips, L. F. *00354-M
Piekaar, H. W. *10297-D
Pierce, J. A. *13265-M
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Piette, L. H. *07097-D
Pilat, M. J. *05810-C 16131-C
Pilet, P. E. 09008-J
Pilie, R. J. *01203-C
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Pinkerton, J. D. 11606-B
Pirila, V. *01794-F 07098-F
Pittock, A. B. *02201-C
Pitts, J. N., Jr. *00602-C 00618-C *00789-C *00935-C 07257-C *00550-D *02368-D *12666-D *16820-L 00608-M 00917-M *00923-M *01210-M 02494-M 02489-M *02496-M *05100-M 08877-M 10512-M 10519-M *12169-M *18025-M
Plass, G. N. *09466-C *04769-D
Plata, R. L. *08692-D 11307-F
Platon, E. 14801-E
Plotnikova, M. M. *08164-F
Plust, H. G. *11584-E
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Polanyi, J. C. *15114-M

Pollack, S. V. 06689-F

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Poller, F., Jr. *02305-C

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*15019-M

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Potter, A. E., Jr.
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Preining, O. 05641-M

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Preston, K. F. *04286-M
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Price, H. E. *15535-G

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*10260-A

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Prindle, R. A. *00375-B
*06839-C *00284-F
*00306-F 00617-F

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*02760-D *04404-M
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Pursall, B. R. *15769-B

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*00933-F

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*08033-B *03828-D

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*11249-M

Raschka, G. J. *03409-J

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*10228-C

Rayher, W. *06146-K

Raymond, L. *03851-E

Razumovskii, S. D.
*13671-M

Reamer, H. H. *11263-B
00476-D *02761-M
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Rebbert, R. E. 01683-D
*00031-M 01233-M
*01888-M *02243-M
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*03561-M *05904-M

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Reinet, J. 09242-F

Reinke, W. A. 03083-F

Reiter, R. *11911-C

Remmers, J. E. *01855-F

Rengstorff, G. W. P. *06105-E

Renzanigo, F. 14255-E

Renzetti, N. A. 07178-B *05797-D *01596-F 05819-F *05849-M *05901-F 07108-M

Reshetov, V. D. *04155-M

Resor, G. III *03011-D

Rex, R. 04405-D

Reynolds, R. R. 07913-D

Reysig, V. A. *13640-M

Rhee, K. H. 05288-M

Rhine, P. E. *14408-D

Riber, C. R., Jr. 02874-D

Rice, O. K. *14232-M

Rich, S. *04476-G 16287-G 16312-G 17097-G

Richards, B. L. *03098-G *05903-G

Richards, B. L., Sr. 09114-G

Richards, J. E. 15212-J

Richardson, N. A. *05894-E

Richter, G. N. *04878-M

Richter, H. G. *09032-D

Richters, V. *03261-F 16661-F

Rickert, Hans *16296-M

Riddick, J. H., Jr. *10490-F

Ridgway, S. L. *07613-E

Riggan, W. B. 07453-G 15482-G

Rihm, A., Jr. 00046-F *01041-J

Riley, E. C. *00228-F

Rimberg, D. 08340-D

Rinehart, W. E. 08054-F

Rinker, R. G. 00432-C 02492-D 03402-D 04900-D 04915-D 04914-M

Ripley, D. L. *01169-D

Ripp, D. R. B. 16085-D

Ripperton, L. A. *04335-C 02747-D 08100-F 03531-G *04348-J 01579-M 03107-M

Risk, J. B. *01071-D

Rispler, L. *01228-B

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Rjazanov, V. A. *01916-F See also: Ryazanov, V. A.

Roberts, D. P. *09743-J

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Robinson, J. W. *17048-D

Robinson, L. B. *11606-B

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Rodebush, W. H. 13417-M

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Rodin, Ye. P. 14624-M

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Rokaw, S. N. *04964-F

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Rose, A. H., Jr.
*00027-B *01848-B
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Rosen, J. M. *03133-C
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*13922-M

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Ross, J. C. 11801-F

Ross, J. M. 00264-D

Ross, L. W. *08463-K
*13781-M

Ross, R. T. *15028-M
*15438-M

Rossano, A. T., Jr.
*04595-A *01170-D
02961-D *05606-D
*07604-L

Rost, G. A. *02763-D

Rostebach, R. E.
*05866-D

Roth, Em. *11241-F

Roth, W. A. 14188-M

Rothe, D. E. 14146-M

Rounds, D. E.
*00665-F *01062-F
*06840-F

Roussel, A. A.
*05128-K

Rozenberg, G. V.
*10408-M

Rozental, O. M.
*04171-M

Rozinskiy, M. Ya.
17351-D

Rozlovskiy, A. I.
*13895-M *14624-M

Rubin, S. 04979-D

Rue, R. R. 05352-D

Ruhnke, L. H. *06987-D

Rumyantseva, M. V.
08436-D

Russell, C.
*16906-G

Ryason, P. R.
*14025-E

Ryazanov, V. A.
*05952-D
See also:
Rjazanov, V. A.

Rylander, R. 00781-J

Ryzhov, V. P. 16463-M

S

Sabaroff, B. J.
*06691-F

Sadarangani, S. H.
01462-D

Sage, B. H. 04913-B
*10475-B 02761-M
*03361-M *09046-M
14636-M

Sahni, R. C. *01889-M

Sakabe, H. *06150-J

Sakaida, R. R. *04915-D
*04914-M

Sakurai, S. 04562-J

Salem, H. 10416-F

Salooja, K. C. *03985-M
*04926-M

Sallee, E. D. *14895-B

Saltzman, B. E. *01650-C
*00385-D *00866-D
*01021-D 01091-D
*03544-D *06613-D
*11130-D 12140-D
*17128-D 01330-F

Salvin, V. S. 02941-H
*09041-H

Samuelson, O. 13253-M

Sancier, K. M. *02306-F

Sandberg, J. S. *08722-J

Sanderson, D. E. 01318-M

Sanderson, H. P. *01447-D

Sapse, A. T. *13846-F

Sardar, M. 13454-M

Saric, M. *05391-F

Saruta, N. *16542-F
*06760-J

Saunders, H. E. 04767-D

Sauvageau, P. 09030-M
09031-M

Savage, B. 00100-F

Savodnik, N. N. 16167-M

Savran, S. V. 16948-F

Savvin, S. B. *17347-D

Sawatani, T. *14224-M

Sawicki, E. *00386-D
*00868-D *01735-D
*01781-D *01839-D
*01922-D *02090-D
*02093-D *02095-D
*02096-D *02799-D
*04029-D *04328-D
*05136-D 05319-D
*11675-D *02082-M

Sawyer, D. T. 04294-M

Sawyer, R. F. 06433-D
06435-D *14924-E
17054-E 10045-M

Sazonov, L. A. *09437-M

Saalfeld, F. E. *05257-D

Scaletti, J. V. *05893-B

Scaringelli, F. P.
*01091-D

Scattergood, D. M.
04465-M

Schafer, L. J. 03701-J
03714-J 03715-J
05111-J

Schaefer, V. J. *16886-M

Scharf, P. B. *07451-B

Scheich, G. 09431-C

Scheel, L. D. 00836-F
*03082-F

Scheer, M. D. 07498-M

Scheve, J. 17330-M

Schiemann, G. *16207-M

Schiff, H. I. 00354-M
03184-M

Schilling, G. F. *05085-C

Schischkov, D. *16341-E
*14471-M

Schlecter, M. M. 01632-M

Schlier, R. *06325-M

Schlipkoter, H. W.
*07174-F

Schlunk, C. 10937-C

Schmid, H. 13224-M

Schmidt, A. *14630-E

Schmidt, K. H. *15270-E

Schmidt, P. 07240-F

Schmitt, K. *13202-E

Schneider, R. A.
*07510-M

Schoen, R. I. 14854-M

Schoettlin, E. C.
*00307-F

Schonfeld, E. *13312-M

Schotland, R. M.
*05190-D

Schrenk, H. H. *03421-F

Schuck, E. A. *11326-B
*00618-C *01602-C
01596-F *01603-F
*02485-F *03883-F
*05819-F 02496-M
02498-M *04863-M

Schuenemann, J. J.
*01782-J 03458-J
*09209-J 01069-N

Schuette, F. J. *01876-D

Schuetz, A. 10507-M

Schulz, E. J. *04040-D

Schulz, G. J. 05253-M

Schulz, H. 10539-E
*10780-F

Schultz, K. F. 04801-M

Schulze, F. *03979-D

Schumacher, H. J. 14815-M

Schumann, C. E. *05336-J

Schumann, G. *08620-M

Schumm, D. E. 09024-F

Schwab, C. A. 05915-D

Schwabe, K. 14450-M

Schwanecke, R. *15152-E
*16299-E

Schwartz, C. H. 05011-B

Sciamanna, A. F. 17168-M

Scofield, F. *15352-B
*11090-K

Scott, W. E. 05818-C
02786-D *05572-D
00251-J *05627-J
16986-M

Scully, D. B. 03986-M

Seagrave, R. C. *00476-D

Sease, W. S. *06688-E

Sebastiani, E. *10336-E

Seery, D. J. *13931-M

Segeler, C. G. *05815-B

Seidman, G. *01818-D
*02537-D *07453-G
*15482-G

Seinfeld, J. H. 15310-B

Seizinger, D. E. 00241-J

Sekigawa, T. *07545-D
*07245-J *07488-M

Selegean, E. *17096-J

Selezneva, Ye. S.
*10724-C

Sensenbaugh, J. D.
00140-B

Seo, E. T. *04294-M

Serat, W. F. *04635-D
*01483-F *05116-F

Serderkhina, D. F.
*08136-D

Serdyuk, L. S. *13822-M

Serruys, M. *10388-B

Sethi, D. S. 05267-M

Setser, D. W. 05051-M
*09594-M

Severs, R. K. 03965-D
03966-D

Shaddick, C. W.
03708-F

Shaffer, N. R. 03462-J

Shafrin, Yu. A. *04202-C
*05459-C

Shah, I. S. *11008-B

Shandala, M. G. *11490-F

Sharma, R. K. *04667-D

Sharp, E. L. *09317-G

Sharp, J. H. 02368-D
07097-D 00923-M
*07085-M

Sharpe, L. M. *09759-B

Shaw, D. B. 00794-F
01977-F

Shaw, J. H. *14992-D
15829-M

Shaw, J. T. *04643-D
10357-D 13932-D
*10066-M

Shaw, M. *14429-D

Shaw, R. *05425-M

Shaw, T. M. 02328-M

Shchirskaya, V. A.
*08135-D

Sheehy, J. P. *00220-B

Shelef, M. *14603-M

Sheleikhovskii, G. V.
*03424-B

Shepherd, M. *00224-D

Sheridan, E. G. 00196-D

Sherman, M. *05814-F

Sherwin, R. P. *03254-F
03261-F *16661-F

Sherwood, T. K. 13561-M

Shesterikova, K. L.
*06872-J

Shibano, M. 17024-D

Shibuya, T. *13628-B

Shiel, F. O'M.
*16606-F

Shifrin, K. S. 14886-M

Shiga, T. *16045-M
*16046-M

Shigemoto, F. H.
09601-C

Shimose, T. 13415-M

Shiota, K. *08320-F

Shirai, T. *11459-J
*17030-M

Shively, J. F. 00730-J

Shore, V. C. 05851-G

Shriner, R. D. 11828-A

Shulman, H. L. 05351-M

Shultz, J. F. 00015-E

Sianu, E. *10100-D

Sidorina, I. Yu.
07518-C

Siedlewski, J. 04556-M
*07513-M *13374-M
*13376-M *13719-M

Siegel, J. *03822-F

Sigsby, J. E., Jr.
00271-B *02375-B
00122-D *04796-D

Siksha, R. *06925-C

Silakova, A. T. *11916-F

Silveston, P. L. 15986-M

Sim, M. *02533-F

Simecek, A. *11742-M
*17002-M

Simonaitis, R. 00935-C
*08829-M *10512-M

Sinclair, W. A. 16354-G

Singer, J. M. *04653-M

Singh, T. *06433-D

Sinha, P. S. 02247-F

Sipple, H. E. 07187-E

Sirs, J. A. *00180-

Sjogren, H. *02464-M
*03177-M

Sjoholm, J. 00189-F

Skala, H. *14607-D

Skam, A. W. 16799-K

Skare, I. *01240-D

Skillen, R. G. 01319-F

Skoe, B. P. 03495-G

Slagg, N. 05904-M

Slater, D. H. *07512-M
11239-M *11248-M

Slater, R. W. *02377-D
03468-J

Slater, W. L. *04668-M

Sleva, S. F. 02162-D

Slevin, J. A. 04283-M

Slonim, N. B. *13182-A

Slote, L. *12158-F

Small, M. 01302-D

Smith, C. R. 15122-M

Smith, D. S. *06435-D

Smith, G. T. *06163-F

Smith, G. V. 00293-D

Smith, I. D. *05649-B

Smith, J. R. 09032-D

Smith, L. E. *00649-F
*06020-F *12157-F

Smith, M. E. 11010-G

Smith, R. 00336-D *04596-D 07885-D 00336-K

Smith, R. G. *10448-F

Smith, R. I. *15452-B

Smith, R. P. 00132-F

Smith, S. B. *03425-D

Smith, W. S. *00030-B *01069-N

Snelling, D. R. 02504-M *15470-M

Sobecki, M. F. 02811-F

Sobolev, G. K. *02309-M 15536-M

Soda, R. 06150-J

Sokolova, T. I. *16461-M

Solberg, R. A. 03696-G

Solomatina, I. I. 10228-C

Sonoda, N. *13029-E

Soong, A. L. *14331-M

Sordelli, D. 01125-E

Sorenson, S. C. *13951-B

Soroka, B. S. 13267-M

Sosnorsky, H. M. C. *16509-M

Sourirajan, S. *03798-E *08207-E

Southerland, J. H. *12148-D

Spankuch, D. 11724-C

Sparrow, C. J. *16799-K

Spealman, M. L. *13417-M

Speizer, F. E. *16520-F

Spence, J. B. 09241-F

Spencer, E. F., Jr. *03762-E

Spialter, L. *03179-M

Spicer, W. S., Jr. *05087-C *00312-F *03083-F *04588-F

Spinazzola, A. *10390-F *08297-J *09391-J

Spindel, W. 17040-M

Spindler, G. B. *02344-C *05055-C

Spindt, R. S. *13547-B

Spotnitz, M. *06635-F

Sprenger, G. *10902-D

Spurny, K. 14705-D

Squire, E. C. 09355-B

Squire, J. M. *16693-M

Stadnik, S. A. 13640-M

Stahman, R. C. 02244-B

Stair, A. T. *00360-C

Stair, R. *05576-C *01690-D

Staisely, C. E. *11810-K

Staisey, C. E. *11810-K

Stalker, W. W. 01685-D *01149-L

Stanetskaya, A. M. 15723-B

Stanley, T. W. 01735-D 01781-D 02093-D 02096-D 02082-M

Stante, C. *07701-C

Starkman, E. S. *01002-B *01375-B *01565-B 03355-B *05411-B *08663-B *09315-D *16777-E *17054-E

Steadman, B. L. *06201-F

Steblova, R. S. *04156-C

Stebbings, J. H., Jr. 06011-F

Stebbings, R. F. *05265-M

Steel, C. 02528-M

Steele, J. L. 09937-F

Steffens, C. *04979-D

Steigerwald, B. J. 00783-C *06841-C *05277-J

Stein, F. 08724-D

Stein, K. C. *03796-E *07607-M

Steinberg, M. 04410-M

Steinfeld, J. I. 15019-M

Stenburg, R. L. *06086-B

Stephany, H. *00539-A 05128-K

Stephens, E. R. *01675-C *05817-C *05818-C *02476-C *11013-C *00237-D *01208-D *03112-D *05572-D 11051-D 02485-F 03292-G 03595-G *03618-G 05627-J *16843-J *00238-M 00939-M *02851-M 04863-M *05268-M *05491-M *11050-M *16986-M

Stephens, R. J. 10970-F

Sterling, T. D. *01520-F *06689-F *11331-F

Stern, A. C. *03085-A *01494-B *09283-C *02951-E *07893-E

Stern, P. 14201-D

Stevens, R. K. *04839-D

Stevenson, H. J. R. 05794-D 05795-D *01318-M *12142-M

Stewart, D. W. 03163-G

Stewart, W. S. *15740-J

Stezhenskii, A. I. *06877-E

Stezhenskiy, A. I. *14554-E *14385-M

Stickney, P. B. 09441-M

Sticksel, P. R. *02465-C

Stier, A. 10791-F

Stockman, R. L. 01949-J *07118-J

Stoddart, E. M. *13546-M

Stoeber, W. 06235-C

Stokinger, H. E. *00852-F *03619-F 04494-F *04495-F *16739-F *04544-G

Stolk, J. M. *00132-F

Stolzy, L. H. *01904-G *17093-G

Stone, R. K. *14127-B

Stopperka, K. *13354-M

Storey, P. B. 00312-F

Storlazzi, M. 00635-D

Story, P. R. *00565-M

Stotzky, G. 15332-G

Stout, C. D. 02518-D

Strandberg, L. *09958-F

Strange, J. P. *08674-D

Straschill, M. *13535-E

Stratmann, H. *04018-D 08256-D 10206-D

Streetman, J. R. *16589-M

Strogal'shchikova, P. N. 06872-J

Strohmeier, W. *16574-M

Strong, A. A. *01495-D 05314-D

Subbaramu, M. C. 03650-C

Subbarao, V. V. 14179-M

Subbaratnam, N. R. *05821-C

Subocheva, N. L. 14073-E

Sucov, E. W. *15056-M

Sugden, T. 12259-M

Sullivan, B. R. *15640-E

Sullivan, J. L. *05500-J

Sullivan, J. O. *09077-M

Sun, B. 11813-N

Sun, K. H. 15115-M

Sunavala, P. D. *08572-M

Sundaresan, B. B. *00959-E

Suppan, P. 06646-M *09082-M

Susan, S. *11239-M

Suter, H. R. *07620-M

Sutton, R. *03355-B

Suzuki, S. *02064-D *07401-D *07402-D *17195-M

Suzuki, T. *07490-L

Svirbely, J. L. *01330-F *04498-F

Svistov, P. F. *04169-D

Swann, H. E., Jr. *00033-F *00779-F *02277-F

Swartz, D. J. *06104-B 02763-D 05609-D

Sweeney, M. P. 00325-B *12011-B *00155-D *05609-D

Swinarski, A. *04556-M

Szargan, P. *14418-M

Szepesy, L. *15100-E

T

Tabachnikov, A. G. 13822-M

Tabershaw, I. R. 06053-F *11347-F

Tabor, E. C. 00144-D *00293-D *01691-D 02241-J *03426-J 02174-K

Tada, O. *04555-D *06112-D 03160-M

Taga, T. *02148-B

Tagaki, S. F. *11132-M

Takahashi, H. 14553-F

Talbot, J. H. *03888-D

Tamplin, B. R. 03295-D

Tank, W. 06993-C

Tandy, G. H. *13533-M

Tanner, R. L. 08105-M

Tash, J. A. 02168-D

Taube, H. 06319-D

Taylor, A. H. *03356-M

Taylor, F. R. 03542-D

Taylor, G. S. *17097-G

Taylor, H. A. *05267-M

Taylor, J. R. *05575-C

Taylor, O. C. *11051-D *00009-G *00963-G 01904-G 02209-G 02916-G *03094-G 03098-G 04853-G 05362-G 05698-G 05745-G *05774-G

Taylor, O. C. (cont'd)
*07255-G 09114-G
11407-G *11748-G
*15514-G 17093-G
*18041-G

Tebbens, B. D. *02203-M

Teele, W. R. 10658-D

Teichner, W. H. 11241-F

Teng, T. L. 15578-G

Terabe, M. *06800-D
*15621-D *16543-D
*17279-D

Terraglio, F. P. *06080-C
*04499-D

Terrill, R. E. 01993-F

Terry, J. P. 07072-K

Terry, R. A. *15211-F

Teske, W. 12637-E

Theones, H. W. *11061-D

Thienes, C. H. *01319-F

Thomas, A. A. *00429-F
*04738-F *10613-F
*11593-F

Thomas, F. W. 00023-B
03777-C 02921-D
*14159-E

Thomas, H. V. *09368-F
*15812-F

Thomas, J. F. 01902-B
08354-D 02203-M

Thomas, J. W. *08340-D

Thomas, M. D. *04987-C
*02845-D *03621-D
05892-D *06460-D
*07106-D *00301-G
*03395-G *16244-G
*13527-L

Thomas, R. 01447-D

Thomas, R. S. 07427-D

Thomas, S. S. *03624-M

Thomas, T. F. *02528-M

Thompson, C. R. *01349-D
*02379-G *04853-G
*06459-G *07255-G
*11407-G

Thompson, D. J. 00392-F
*03427-F

Thompson, J. R. 05295-F

Thompson, K. C. 08835-D

Thomson, W. W. *01905-G
*04724-G

Threshow, M. *01250-G

Thrush, B. A. 13452-M

Thurauf, W. *03233-B

Thynne, J. C. J. 16913-M

Tiezzi, E. 16235-M

Tiffany, W. B. *15118-M
*15139-M

Tikhonenko, A. D. *09981-E

Tilson, S. *00984-A

Tillman, J. H. 03505-J

Timmins, G. W. 06471-D

Ting, I. P. *10713-G
12034-G

Tingey, D. T. 07455-G
16517-G

Tipson, R. S. *03234-D
00058-M *09200-M

Tkach, Yu. A. *13375-M

Todd, G. W. *03626-G
*03627-G *03628-G
*03629-G *03630-G
*05777-G *05778-G

Tokiwa, Y. 03099-D
*03295-D 00339-F
00659-F

Tomingas, R. 02648-E

Tomlinson, H. *16287-G
*16312-G

Tonomura, M. *05562-J
*15173-J

Toothill, C. *16066-F

Toporova, V. V. 13943-M

Tosihide, O. *15772-E

Tow, P. S. *15941-E

Townsend, A. A. *05474-C

Townsend, C. R. *09770-D

Toyama, Y. *09907-D

Trawinski, S. 07513-M
13719-M

Treinin, A. 01106-C

Treshow, M. *16313-G

Tret'yakova, V. A.
*03924-D

Trobisch, K. *13068-E

Trofimov, A. I. *13718-E

Trofimova, L. V. 08524-B

Tromp, S. W. *00521-F

Trop, C. E. *03625-F

Truche, M. R. *10778-F

Tseytlin, A. N. 13689-E

Tsivoclou, E. C. 00051-D

Tsuge, M. *00445-J

Tubbs, L. D. 14408-D

Tucker, H. G. *03252-F

Tuerkoelmez, S. *16365-E

Tuesday, C. S. 17387-C
*02837-M 02838-M
03114-M *03428-M

Turk, A. *04546-J

Turner, B. *04548-C *06480-C

Turner, D. 02635-B

Turner, J. F. 00232-G

Tverkovkin, B. Ye. 14056-M

Tye, R. *01395-D

U

Ubisch, H. V. *09250-J

Ubl, Z. *09983-D

Uhi, K. *14486-D

Ui, K. 07391-D

Ulrich, C. E. 00632-F 00637-F 02223-F *02811-F

Umans, R. S. *11802-M

Umstead, M. E. 00060-D 15486-M

Ung, A. Y. *03184-M

Urone, P. *07654-D 16857-D

Ury, H. K. *11335-F

V

Valdes, S. 08997-F

Valenzuela, R. 12644-C

Valori, P. *08296-D

Valko, P. *16405-C

Van, C. 08935-B

Van Arsdol, M. D., Jr. *06945-N

Van Der Drift, J. *14481-E

Vander Wal, J. F. *02899-M

Van Haut, H. *10206-G

Van Sickle, D. E. 05058-M

Varanasi, P. *01112-M

Varlamou, M. L. *13899-E

Varshavskii, T. P. *04634-E

Vassiliou, E. 02188-D

Vasil'yev, L. L. *04480-F

Vaughan, S. 11807-F

Vaughan, T. R., Jr. *11632-F *16055-F *16738-F

Vcelak, V. *11842-D

Velkoff, H. R. 09172-M

Venezia, R. *00858-B *01604-B *11224-J *01604-K

Vengerskaya, Kh. Ya. *10639-B

Veninga, T. S. *08965-F

Vernot, E. H. *07709-D *09906-D *03813-F

Vingiello, F. A. *01632-M

Virtu, N. 07701-C

Vodar, B. *16051-M

Vogh, J. W. *16781-D *11771-M

Volker, W. 10917-M

Volman, D. H. 00611-C

W

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00956-D 01021-D
01086-D 01685-D
01691-D 02045-D 02063-D
02368-D 02492-D 02799-D
03096-D 03099-D 03245-D
03402-D 03621-D 04018-D
04643-D 04696-D 04900-D
05078-D 05352-D 05548-D
05606-D 05786-D 05866-D
06460-D 06613-D 06642-D
06832-D 06911-D 07114-D
07540-D 07938-D 08135-D
08256-D 08894-D 09721-D
09906-D 10242-D 11562-D
11738-D 11855-D 12338-D
13493-D 14213-D 15521-D
00097-E 01791-E 14902-E
16691-E 00165-F 00338-F
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02213-F 02483-F 03254-F
03257-F 03261-F 03853-F
05295-F 06053-F 06055-F
06201-F 06717-F 06745-F
08026-F 08570-F 08812-F
09232-F 09368-F 09412-F
10490-F 10685-F 11297-F
11306-F 11308-F 11539-F
11565-F 11670-F 11679-F
11682-F 12079-F 12173-F
13852-F 13868-F 14050-F
14065-F 14377-F 14493-F
16661-F 16840-F 17027-F
17055-F 17061-F 17311-F
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10206-G 11748-G 16517-G
17109-G 02241-J 03714-J
04562-J 05112-J 08297-J
00354-M 00923-M 01318-M
02508-M 03575-M 03682-M
04410-M 04633-M 06320-M
09079-M 10907-M 11279-M
11770-M 12142-M 13341-M
13354-M 13408-M 13452-M
13561-M 13683-M 13889-M
14081-M 14179-M 14317-M
14384-M 15495-M 16043-M
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01169-D 03218-D 03948-D
04555-D 04857-D 05081-D
05609-D 06301-D 06435-D
06889-D 07391-D 07482-D
09032-D 09515-D 09969-D
10357-D 10902-D 11130-D
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06867-E 06877-E 07093-E
07549-E 07554-E 07881-E
09340-E 13160-E 13535-E
13538-E 13554-E 13662-E
13707-E 13718-E 13899-E
14034-E 14481-E 15087-E
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03361-M 03428-M 04578-M
04653-M 08845-M 10907-M
10911-M 10913-M 12230-M
13417-M 13448-M 13545-M
13546-M 13574-M 13640-M
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03234-D 03690-D 04044-D
04405-D 04579-D 06319-D
07401-D 07402-D 07830-D
08894-D 09032-D 09108-D
09515-D 10513-D 12140-D
13932-D 15621-D 16857-D
14424-E 01588-F 03252-F
03883-F 11347-F 16794-F
16840-F 00009-G 00121-G
00184-G 00229-G 00655-G
00696-G 00950-G 00953-G
01014-G 01250-G 01666-G
01800-G 01809-G 03496-G
03521-G 03595-G 03608-G
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03234-D 07709-D 08296-D
11842-D 11903-D 13932-D
17047-D 04838-E 15087-E
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00058-M 00939-M 02838-M
03160-M 03807-M 03985-M
04454-M 04771-M 05058-M
05208-M 05378-M 06719-M
07607-M 08254-M 08700-M
09046-M 09200-M 09755-M
10043-M 10045-M 10066-M
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13688-M 13692-M 13843-M
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13939-M 14055-M 14092-M
14224-M 14385-M 14418-M
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05491-M 08254-M 09077-M
10911-M 10912-M 11245-M
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01752-C 01758-C 02201-C
02458-C 02465-C 02476-C
02524-C 02869-C 03649-C
03953-C 04149-C 04152-C
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04168-C 04202-C 04988-C
05459-C 05576-C 06047-C
06481-C 06916-C 06918-C
07976-C 07980-C 08625-C
10787-C 10980-C 11274-C
12633-C 12644-C 16618-C
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01240-D 01266-D 01349-D
01393-D 02188-D 02518-D
03159-D 03537-D 03544-D
03979-D 04044-D 04150-D
04151-D 04157-D 04160-D
04162-D 04169-D 04467-D
04767-D 05190-D 06050-D
06319-D 06352-D 06460-D
06984-D 07379-D 07441-D
07684-D 07867-D 08049-D
08135-D 08311-D 08436-D
08859-D 09032-D 09108-D
10100-D 10315-D 10489-D
10902-D 12140-D 12338-D
13153-D 14201-D 14408-D
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15772-E 15948-E 16691-E
17238-E 00165-F 00672-F
00738-F 01168-F 01218-F
01977-F 02811-F 02213-F
03619-F 04048-F 04312-F
04323-F 05364-F 05538-F
06415-F 06608-F 06618-F
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08499-F 08965-F 10492-F
10623-F 10670-F 10685-F
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10790-F 10792-F 11539-F
13058-F 15579-F 16705-F
16905-F 00121-G 00184-G
00244-G 00316-G 00654-G
00696-G 00737-G 00775-G
00950-G 01421-G 01904-G
02313-G 02744-G 03092-G
03098-G 03495-G 03573-G
03617-G 03626-G 03628-G
03629-G 03630-G 03961-G
04476-G 04582-G 04684-G
04707-G 04724-G 05131-G
05279-G 05362-G 05698-G
05774-G 05777-G 05778-G
05844-G 05902-G 06447-G
07455-G 07610-G 09114-G
10426-G 10674-G 10690-G
10713-G 10978-G 11581-G
11748-G 11501-G 12042-G
12043-G 12149-G 12047-G
12166-G 12944-G 13174-G
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14962-G 14963-G 14966-G
14968-G 15286-G 15332-G
15535-G 16273-G 16287-G
16311-G 16312-G 16313-G
16354-G 16362-G 16704-G
17210-G 17227-G 04320-H
11815-I 00688-J 02832-J
03714-J 04173-J 04348-J
05111-J 06169-J 07083-J
07478-J 09268-J 09467-J
11627-J 11775-J 00371-M
02504-M 03016-M 03149-M
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01625-D 02354-D
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06987-D 07889-D
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06020-F 08334-F
11535-F 12157-F
16780-F 00009-G
00229-G 00654-G
00655-G 00737-G
00950-G 01728-G
01905-G 02916-G
03292-G 03472-G
03618-G 04576-G
04707-G 05131-G
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02179-J 11459-J
02534-M 02535-M
02853-M 03488-M
04583-M 07500-M
09749-M 11771-M
13364-M 14815-M
17010-M 17195-M
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00345-C 00465-C
00502-C 00602-C
00611-C 00613-C
00618-C 00757-C
00789-C 00935-C
01027-C 01194-C
01264-C 01406-C
01407-C 01408-C
01504-C 02359-C
02869-C 04164-C
05533-C 05711-C 05818-C
06069-C 06604-C 06632-C
07456-C 07257-C 08330-C
15713-C 16846-C 01591-F
02842-F 04645-F 00229-G
00696-G 03615-G 03618-G
00550-D 01683-D 02368-D
02747-D 05572-D 06955-D
07981-D 11305-D 12362-D
15354-D 01830-J 03104-J
06551-J 16927-J 00034-M
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02817-M 02904-M 03066-M
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